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Dec.
1959

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ARTICLES
SEE PAGE 5



Lelloy W. Van Kleeck, for many years Principal Sanitary Engineer for the Connecticut State Department of Health, is now in charge of the Hartford office of Rowe, Albertson & Associates. See also page 23.

PAYLOADER®



9 years of year 'round usefulness

Attachments that trim equipment budgets

Drott 4-in-1 Bucket
Hydraulic Back-Hoe
Vibratory Soil Compactor
Pick-up Street Sweeper
Rotary Snow Plow, "V", One-way and Reversible Plows
Blacktop Spreader
Angling Backfill Blade
Leaf Loader • Fork Lift
Side Boom • Crane Hook

In 1950 the City of Cloquet, Minnesota (pop. 7,000) bought its first rubber-tire tractor-shovel — a 4-wheel-drive "PAYLOADER". Up 'til then, it had used only crawler type machines. This first venture "on rubber" was so satisfactory that it added a second "PAYLOADER" in 1955. Then it bought a model H-70 in 1959, trading in the original 1950 machine which, in 9 years of service, had required no repairs except a hydraulic ram re-pack.

Cloquet's two "PAYLOADER" tractor-shovels go all over town to get jobs done fast — loading gravel, topsoil and blacktop, and doing all kinds of lifting, loading and general maintenance work. In the winter they are very much in the snow-removal battle — one being equipped with a "V" plow and the other being used to load out snow and to pile it up to 15 feet high because of limited disposal area.

Public Works Departments of all sizes and kinds — city, town, county and state have mechanized their maintenance with mobile, dependable "PAYLOADER" tractor-shovels backed up by reliable Hough Distributor service.

HOUGH®

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
761 Sunnyside Ave., Libertyville, Ill.

Send data on all "PAYLOADER" models and useful attachments.

Name _____

Title _____

Gov't. Unit _____

Street _____

City _____

State _____

12-B-3

from "Chicago"

INTRODUCING

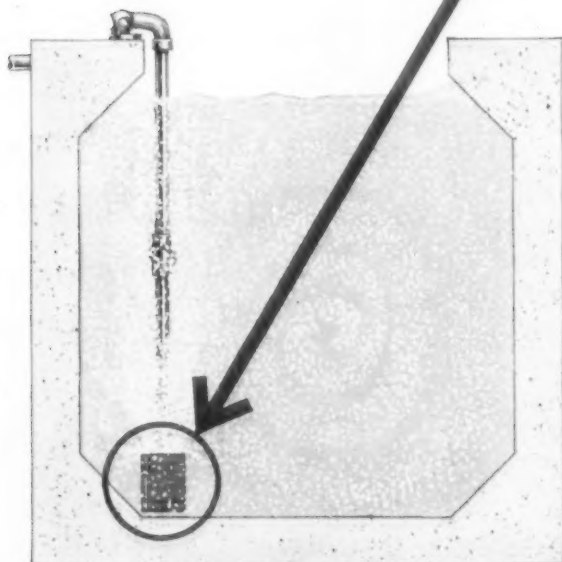
the Hydroshear

AIR DIFFUSION SYSTEM

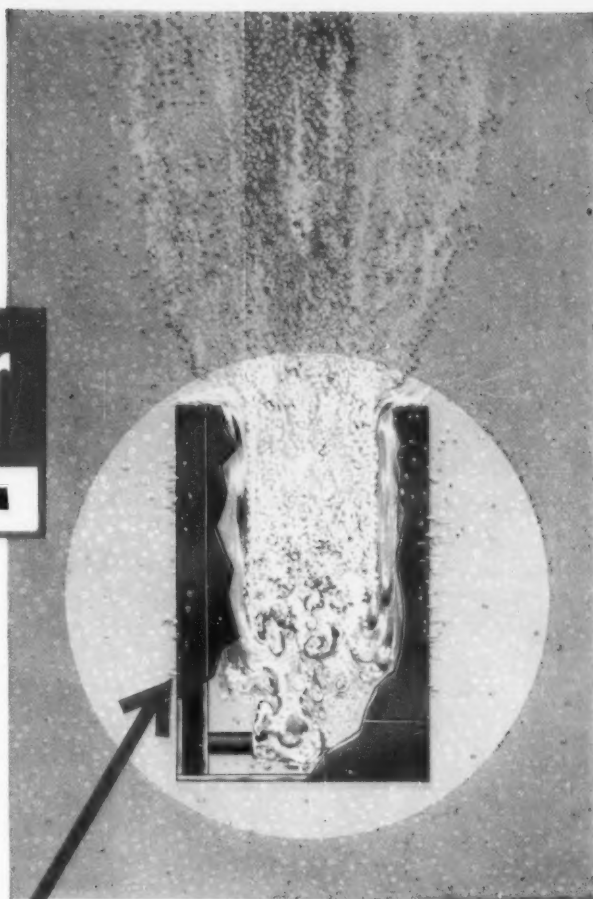
Patents Pending

... induced counterflowing air-liquid streams shear large air globules from nozzles into fine bubbles ... causing instantaneous oxygen transfer to liquid, from turbulence, and thousand-fold increased air film surfaces.

Fine bubbles from porous diffusers are re-circulated by counterflowing streams to greatly increase total oxygen transfer due to sub-surface tank turbulence.



Aeration Tank section showing SWING DIFFUSER with "SHEARFUSER" Header



HYDROSHEAR action in "SHEARFUSER" Nozzle Aerator

PROVIDES

... CLOG-PROOF, highest oxygenation and circulation at lowest air pumpage and power usage.

USES

... fine bubble "SHEARFUSER" Air Nozzles, or Porous Diffusers, to obtain required aeration ... combined with SWING DIFFUSERS for operating flexibility.



Putting Ideas to Work

**Chicago
Pump
Company**

622H DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

© 1959-CPCo.-FMC.



No. 955 excavates part of a total of 19,000 yd., preparing for base an area 20 ft. wide, 12-13 in. deep. Cuts are made by Cat No. 12 Motor Grader and windrowed. Job is part of a \$1,828,366 project by Gulf Bitulithic Co. on U. S. 75, to be part of the Interstate Highway System.



Says Operator F. H. Leggett: "I can move over 100 cu. yd. a day more with the side dump than with other loaders. It doesn't spill dirt because you don't have to jockey for position. A Traxcavator is easy to operate and I'm less tired at night. It's the best on the market."



Weather bad...

No. 955 terrific...

job on schedule!

The performance and versatility of a Caterpillar No. 955 Traxcavator with Side Dump Bucket was vividly demonstrated on a recent highway project in Texas. What happened is of importance to every municipal and county official concerned with the purchase of equipment.

Bad weather cut work days to 20 per cent during the first six months on a 2½-mile widening job on U.S. 75 at Conroe, Texas. A drag line proved a poor producer in the shallow cut. Switching to a Cat No. 955 Traxcavator with Side Dump Bucket, Gulf Bitulithic Co., Houston, Texas, got the job back on schedule—and kept it there! Five-yd. trucks were loaded in an average time of three minutes; four buckets to the truck.

"We increased production 25 per cent," says Superintendent Thomas "Red" Brown. "I like that Side Dump Bucket. You can't beat it."

In-line loading of trucks with the Side Dump Bucket paid off in less traffic congestion on the busy highway, and it also avoided tearing up the subgrade with twisting and turning.

Side Dump Buckets are available on all three Traxcavators: No. 977 (2¼ cu. yd.), No. 955 (1½ cu. yd.), and No. 933 (1¼ cu. yd.). Other buckets, teeth, dozers and forks help make a Traxcavator the most versatile excavator-loader.

More and more municipalities and counties are finding the performance and versatility of Cat-built Traxcavators can save taxpayers' money. Ask your Caterpillar Dealer today to demonstrate on your operation. And remember, his reliable parts and service facilities stand behind your investment.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR

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**YOUR TAXPAYERS GET
THEIR MONEY'S WORTH
WITH CAT-BUILT MACHINES**

PUBLIC WORKS

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

DECEMBER, 1959 • Volume 90, Number 12

How Connecticut Reduces Guard Rail Weeding Costs 83 <i>Soil sterilants, growth inhibitors and selective and non-selective herbicides provide powerful tools for roadside vegetation control.</i>	Tri-Fuel Engines Power New Secondary Sewage Treatment Facilities 108 <i>Toledo's expanded plant can use digester gas, natural gas or diesel fuel for power.</i>
Coordinating Flood Control and Storm Drainage for County Roads and City Streets 85 <i>The Alameda County Flood Control and Water Conservation District, through the use of a comprehensive master plan, has developed a successful system for cooperation between various local governments.</i> HERBERT G. CROWLE	Old and New Procedures in Water Coagulation 111 <i>A comprehensive review of coagulation principles, with emphasis on the use of the newer coagulant aids.</i> CHRISTOPHER P. BLAKELEY
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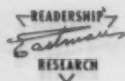
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WALKER PROCESS

PACKAGE PLANTS

UNIT DESIGNS FOR SMALL SEWAGE TREATMENT PLANTS

SIMPLE OPERATION — 90% automatic

ODOR FREE — no septic or stale operations

ADAPTABLE — concrete or steel tank construction

Details and preliminary plans are available to Consulting Engineers and their Architects, concerned with the design of small communities, subdivisions, institutions, schools, etc.



SPARJAIR Unit installed at a large Florida motel to handle 25,000 gpd combined sanitary and restaurant wastes. Note proximity of plant to motor court. Odor-free operation eliminates need of isolating plant.

SPARJAIR UNIT — Nested Contact Stabilization Plant — an easy to operate, low cost, small sewage treatment plant that is a model of simplicity. Designed on a new but proven principle, the contact stabilization process aerates and thoroughly oxidizes all odors in the sewage and overcomes previous objections to locating a plant near residences, shopping areas, schools, etc. Raw sewage settling tanks and septic digesters are eliminated. This plant utilizes a separate chamber for complete aerobic digestion (42% volatile remaining) of excess sludge.

Simple operation with minimum moving parts requires only part time attention. Capacities from 50 to 5000 population equivalent.

AEROBURN PLANTS — Package Aerobic Digestion; 24-hr. "Wet Burn" Aeration—

designed for installations where economy is a prime factor and clarity of plant effluent is not vital. As with SPARJAIR units, the operation is odor free and practically automatic; with no delicate biological balances to achieve and hold.

Four standard sizes at 50, 100, 150 and 200 population equivalent.

SPARJPAC — Package Trickling Filter Plants — combines trickling filter and "wet burning" digestion in a two-story, compact design to provide best features of each type of treatment. SPARJPAC plants utilize DOWPAC® trickling filter media, developed by The Dow Chemical Company.

Design capacities range from 50 to 2500 population equivalent.

(DOWPAC is a registered trademark of The Dow Chemical Company).



WALKER PROCESS EQUIPMENT INC.

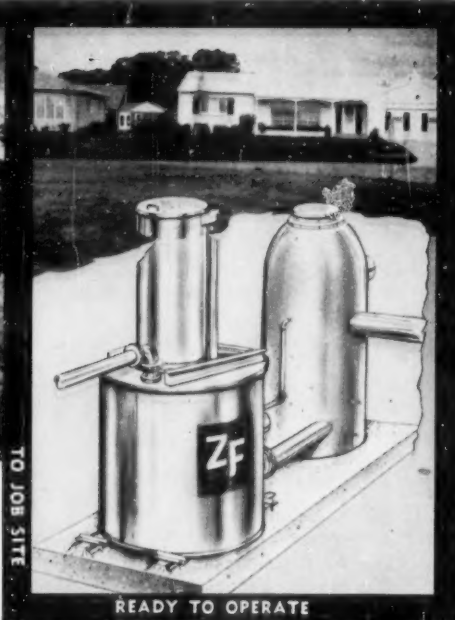
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engineering offices

AURORA, ILLINOIS

ZF PREFABRICATED PUMPING STATIONS



THIS IS THE STATION THAT IS PREFABRICATED AND DELIVERED



READY TO OPERATE

A PACKAGED UNIT—completely shop-fitted with quality components throughout. Transported to job site ready for installation.

SIMPLIFIES LOCATION—underground operation permits use of existing public property such as parkways, etc. Saves cost of surface property and enclosing structure.

ECONOMICAL—saves costs and time. Prefabrication results in lower construction costs and less time at job site. Simply set in place, connect and start up.

ZF

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COMPLETE DATA, SPECIFICATIONS AND DRAWINGS AVAILABLE—WRITE



The Wild Blue Yonder and Our Public Works

WHAT WILL BE the situation in our public works engineering field in another generation? It is time to do some thinking in the wild blue yonder category. That is, where will we be in refuse disposal, waste treatment, water supply, street and highway space and downtown parking. At our rate of increase of water use, how long will it be before less-watered areas will have reached their limit of growth; and what can be done to overcome these limits? Since waste water increases directly with the consumption of water, will our present methods of treatment reduce sufficiently the organic loadings on our streams so that they can continue to be used for water sources? With a probable one hundred million cars on the road, what about parking and traffic control? Where will these problems be most crucial? These are only a few of the things that require unrestricted and open-minded thinking. Industry has faced problems of a similar nature and has solved some or many of them. We believe the public works engineering profession can do the same.

The Need for Urban Improvement and Urban Renewal

THERE HAS been a good deal of publicity of late about juvenile delinquency. Like everyone else, we are against this and often feel that much of it could be cured by good old home remedies, well applied. However, our housing conditions are generally far more responsible than is home laxness. In too many cities, through housing shortages and the loophole in housing laws regarding furnished rooms, overcrowding has reached such an extent that there is almost no place for young folks except on the streets. An apartment house of six five-room apartments can readily handle 25 or 30 persons, but when it is permitted to house 25 or 30 families, slum conditions exist, home life is destroyed and juvenile delinquency is almost inevitable. Urban renewal and development can help. Properly applied knowledge can make our slums more livable. It will cost money, but there is no place where it can be spent to better advantage from all viewpoints, including specifically crime reduction, health improvement, tax income and business.

Promotion Humps and the Promotion Problems

ON ANOTHER page of this issue is a letter from the Navy Chief of Engineers stating that a number of officers of the Civil Engineer Corps will shortly be available through retirements necessary in order to bring the number of officers in each grade to the levels fixed by Congressional appropriations. We hope our readers will find it possible to use this excellent source of engineering manpower.

Humps in promotion lists have caused pain and anguish after every war. Following World War I, the Army practically ceased making promotions for some years; some majors remained in that grade for nearly 20 years. Then World War II came along. Following that, many reserve officers remained on active duty; their plight was highlighted a couple of years ago by stories of field officers—in some cases colonels—returning to the Army as enlisted men in order to preserve retirement rights.

We have no remedy to offer; a soldier or sailor, no matter what his rank must take what comes if he elects to remain in the service. We regret deeply the necessity for these reductions and we hope that, in this case, these well-qualified navy officers will quickly be absorbed by our State and local public works agencies. They should make valuable additions to any staff.

How Will We Be Fixed for Future Traffic Handling?

OUR FOLKS who make somewhat of a business of forecasting and predicting are now telling us that there will be a hundred million automobiles on the road in the foreseeable future. When that time comes, how will we be fixed for the resulting traffic; and indeed how will we be fixed five or ten years from now? Maybe we can get more of these little cars now being made on a mile of road, but that will not be the answer. The solution will come only from more highway construction, better design, very high grade maintenance, more complete snow removal and automatic traffic control devices. And when we talk about highways, we mean streets, too; in fact the biggest problem is going to be in our centers of population where there is less space for cars and more of them. It is high time to order a large consignment of first class crystal balls; and also to get to work very diligently.

NEW CAMPAIGN STARTS COMMITTEES ACROSS



For the first time, a nationally organized plan to develop local action to combat our growing water shortage has been devised by a supplier to the industry. The need for a campaign to stimulate such action was recognized by the Cast Iron Pipe Research Association. Here's how the first year of the campaign was planned—and the successful results it produced.

Frank ads warned of shortage



The theme of the ad campaign "What Will You Do Without Water?" was coupled with dramatic photographs of people using water in everyday situations.

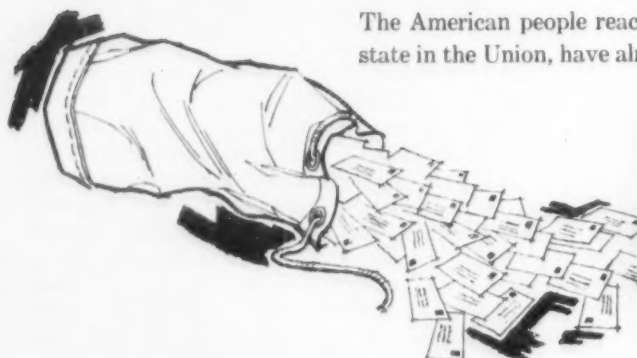
Informative booklet told how everyone could help



Each ad offered the booklet "Water—Make Sure You'll Always Have Plenty," which outlined working plans for local action against water problems.

Response was heavy!

The American people reacted immediately; thousands of requests, from every state in the Union, have already been sent in for the booklet—but that's not all!



LOCAL WATER IMPROVEMENT THE COUNTRY!



Research shows people took action!

The average person who wrote in for the booklet did at least three things. For instance:

- * He informed neighbors and friends of the problems, discussed solutions, and sought more information.
- * He requested a starter kit from Cast Iron Pipe Research Association—to help spur more interest and plan new and better water facilities.
- * He formed or joined a local water improvement committee in order to take direct and immediate action.

Here are just a few of the remarks received on the worth and completeness of the program.

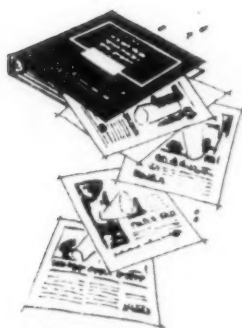
From a housewife in Connecticut: *"Although I had no such intentions before, I'm going to do something about the suggestions given."*

From a teacher in the state of Washington: *"Last month I was elected as a trustee for the Local Water User's Corporation. We are now in the process of installing a new water reservoir; your program was a very helpful source of information."*

From a retired man in Florida: *"Our city is talking of putting in a new water supply system in order to tap river water. Your literature has been very useful."*

The American people are interested and willing to face the problem; they need only your guidance.

Now . . . A complete program for you!



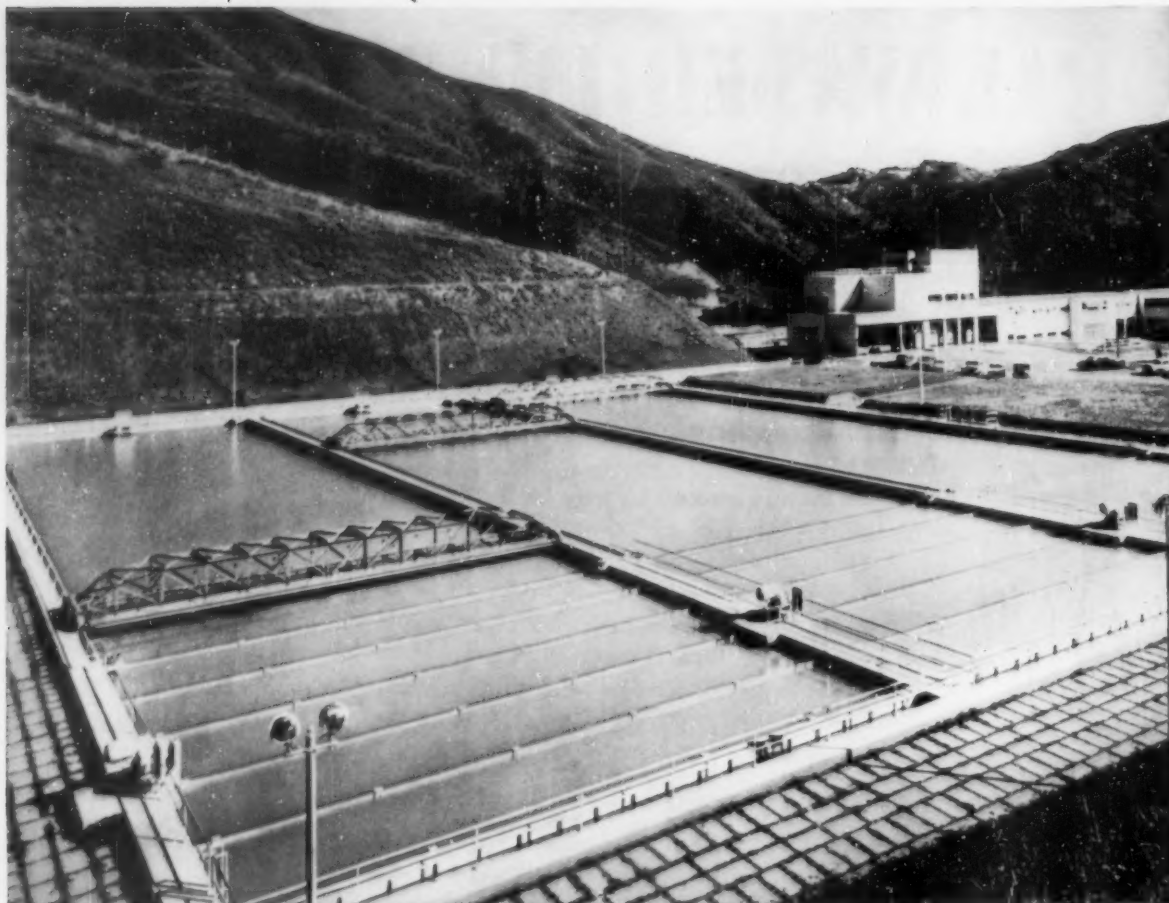
A complete portfolio has been compiled for you—to help you stimulate action in your community . . . to help you answer some of your own local water problems. If you are now faced with a local water problem in which community relations will play an important part, write on your letterhead to the Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Ill., Thos. F. Wolfe, Managing Director.

The Cast Iron Pipe Research Association is proud of the job it has done—and looks to the future with confidence that the American people can and will lick the water problem!



CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE



La Mariposa Water Treatment Plant: Dorrco Monorakes in rear basins; Flocculators in foreground.

CARACAS, VENEZUELA

Dorr Monorakes, Flocculators Boost Capacity

Caracas, with a population over one million and rated one of the world's fastest growing cities, recently completed a second addition to its La Mariposa Water Treatment Plant to increase capacity from 16 to 80 MGD.

The original plant was equipped with two Dorrco Squarex Clarifiers, 115' square by 14' s.w.d., and two Type "T" Flocculator units for basins 115' long by 40' wide by 11' s.w.d.

To achieve the five-fold boost in capacity, Dorr-Oliver equipment was again chosen. The recent additions comprise three Type "A" Dorrco Monorakes for basins 202' long by 65' wide by 14' deep, three Type "T" Dorrco Flocculators 50' long by 65' wide by 11' deep, and twelve new Filters.

DESIGN ENGINEERS: Instituto Nacional de Obras Sanitarias.

Every day over 8½ billion gallons of water are treated by Dorr-Oliver equipment.

Squarex, Dorrco—T.M. Reg. U.S. Pat. Off.



DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

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FIRST PVC RIGID CONDUIT INSPECTED AND PASSED BY UNDERWRITERS LABORATORIES!



Only KRALOY, yes only KRALOY, among all plastic conduits, now carries U-L listing — another first for KRALOY! High impact KRALOY PVC (Polyvinyl Chloride) RIGID CONDUIT... the *lifetime* conduit... the *perfect* conduit... won't rust, won't pit, won't corrode, won't support combustion, is non-magnetic and non-sparking. KRALOY needs no paint, no coating, needs no lining, and its mirror-smooth inside wall makes fishing easier than with any other type of conduit. Add these outstanding features to KRALOY's extreme light weight (see chart below) and you have the *ideal* conduit... ideal for direct burial and slab work. Installation costs can be cut *drastically* with light weight KRALOY PVC RIGID CONDUIT. Consider the dollars to be saved in handling and installing U-L listed KRALOY CONDUIT Cat. No. KE-1058 versus steel, *versus even aluminum conduit*:

*KRALOY PVC CONDUIT is
sold only through wholesale
electrical supply houses.*

NOTE WEIGHT COMPARISON — KRALOY PVC vs. ALUMINUM vs. STEEL CONDUIT

U.L. required minimum weight per 100 ft. including couplings, lbs.

K-59-29

Trade Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"
KRALOY PVC	15.0	20.0	29.0	40.0	47.0	63.0	101.0	131.0	159.0	187.0	253.0	326.0
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

For complete information on KRALOY PVC CONDUIT and installation directions, mail the coupon or write to Kraloy Plastic Pipe Co., Inc., 4720 East Washington Blvd., Dept. PW-12, Los Angeles 22, Calif.



Kraloy Plastic Pipe Co., Inc., Dept. PW-12
4720 East Washington Blvd., Los Angeles 22, Calif.
Gentlemen: Please send me your new Brochure on KRALOY PVC CONDUIT which gives complete information and installation directions.

Name _____
Address _____
City _____ Zone _____ State _____

NO CONDUIT REPLACES

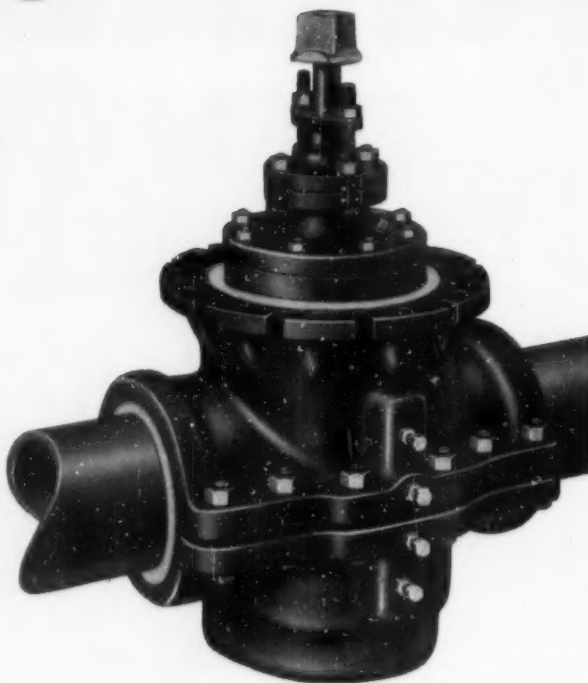
KRALOY

install valves *without* interrupting service!

You can add needed gate valves anywhere in your water system—without a shut-down—when you use **MUELLER®** Inserting Valves. These valves are specifically designed to be quickly, easily installed in any existing 4", 6" or 8" cast iron main under full service pressure. There is no loss of water, no interruption of service and no loss of fire protection.

The gate valve mechanism of the Mueller Inserting Valve is identical to that of dependable Mueller AWWA Gate Valves and Mueller Tapping Valves. This permits standardizing on one type of valve mechanism for all your valve needs.

This product feature is typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product produced for the water works industry.



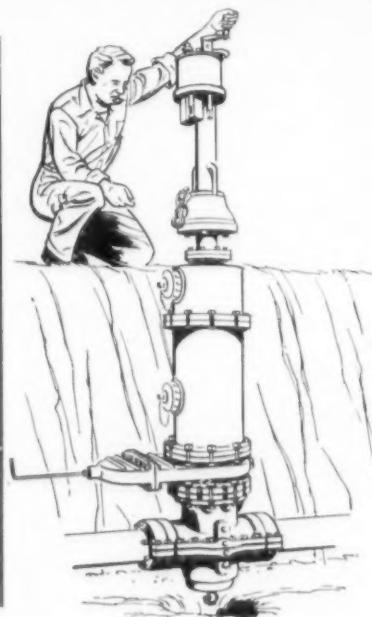
here's how with Mueller Inserting Valves



1. Bolt sleeve halves to main and calk end joints.



2. Cut out section of main with Mueller Drilling Machine.



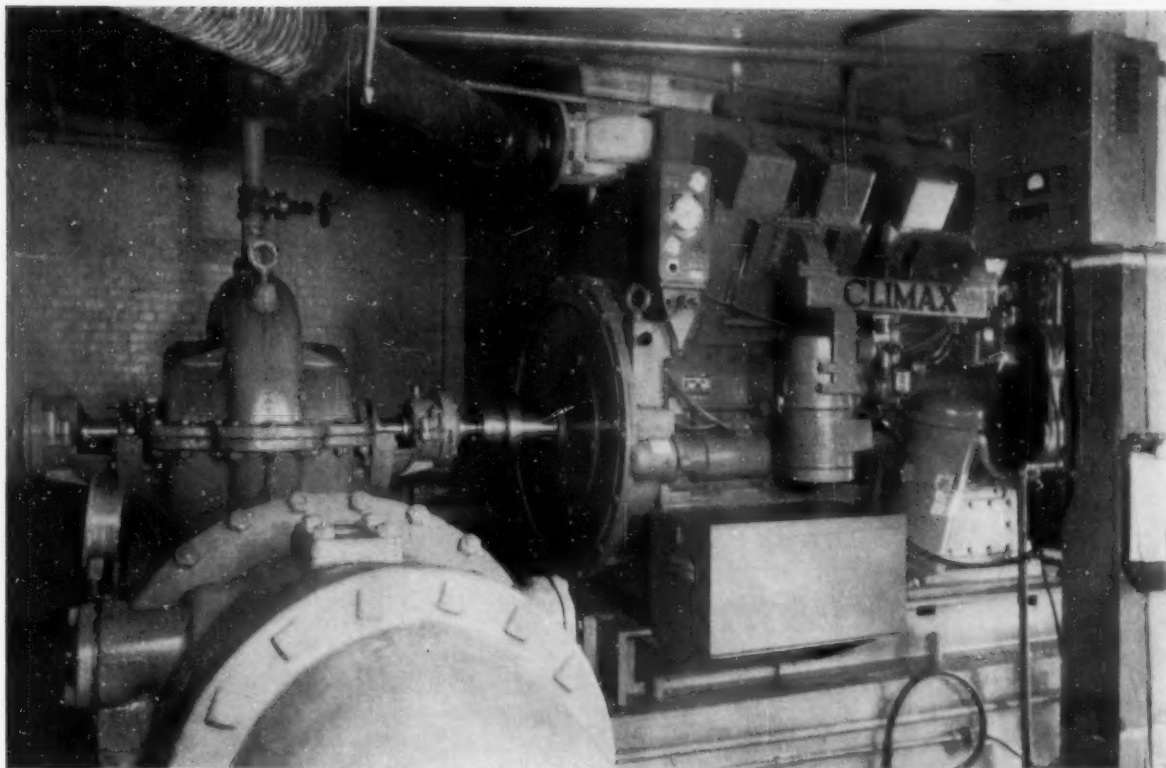
3. Lower valve plug assembly into main and secure.



**MUELLER CO.
DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles;
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in an emergency...



ENGINE INSTALLED BY POWER SERVICE CO., ATLANTA, GEORGIA

in case of fire and power failure

CLIMAX V-85 ENGINE

DRIVES PUMP

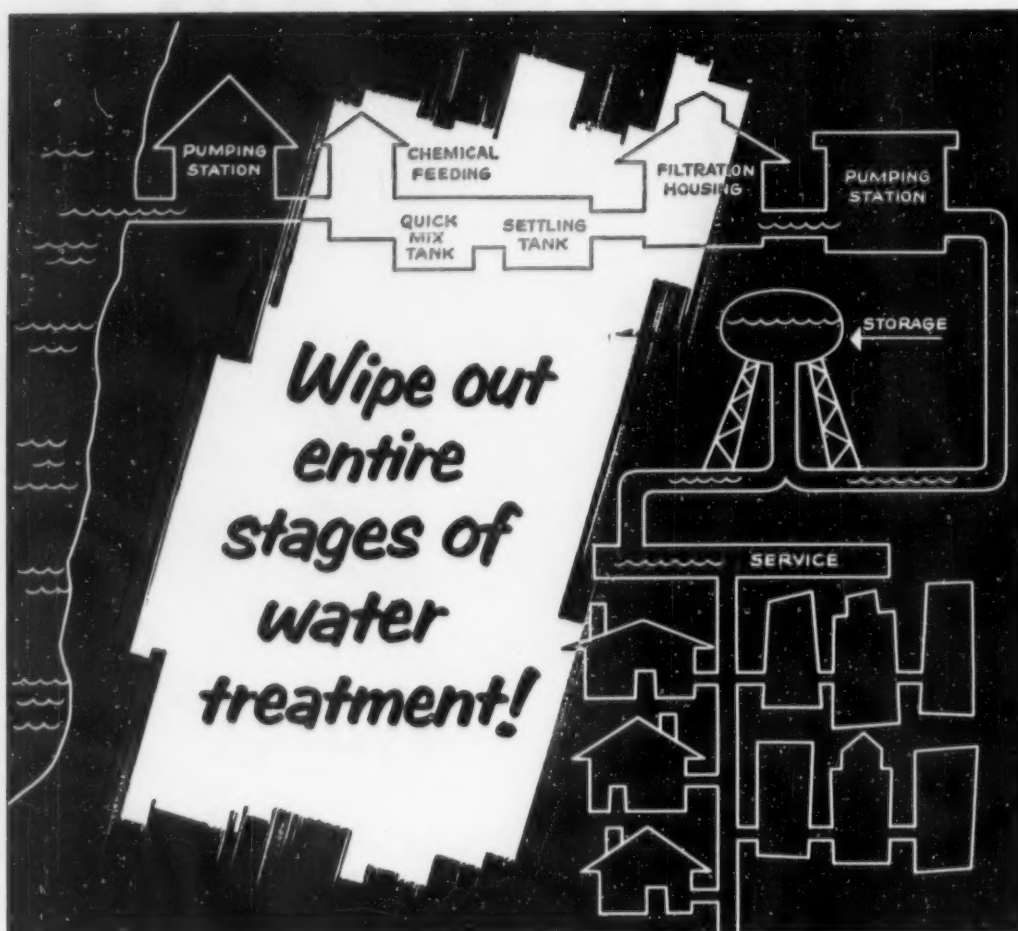
to protect the Georgia Division Plant of
LOCKHEED AIRCRAFT CORPORATION

The largest aircraft plant under one roof in the United States—Air Force Plant No. 6 at Marietta, Georgia—is operated for the Air Force by Georgia Division of Lockheed Aircraft Corporation to build C-130 Hercules Cargo-Troop Carriers. Here—ready for emergency—is a Buffalo 10" Class S double suction pump with 22½" diameter impeller, driven by a V-85 Climax 390 hp engine. With its minimum capacity of 4500 gpm at 100 psi discharge head, this unit will go into action

pumping water in the event of fire and a power failure. The V-85 Climax Engine—8-cyl., 60° V-type, 7½-in. bore x 7-in. stroke, 2474 cu. in. displ.—burns butane or natural gas. Fuel economy is built in. The unusual compactness of Climax V-8 design means more power packed into less space. Rugged, too, for durability with dependability in continuous duty utility plant pumping and generator service. For all its plus-value features get Bulletin SA-584.

CL-110

CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY—CLINTON, IOWA



A complete Celite diatomite filtration system can eliminate the costs of conventional pre-treatment facilities

Now you can do something about skyrocketing per capita water consumption costs—as are dozens of municipalities every year. And get clearer, sparkling-bright water in the bargain!

Install one of today's small compact diatomite filtration plants, using Celite® filter aids. In many cases, raw water can be filtered directly, eliminating several of the costly conventional pretreatment stages—flocculation, quick-mixing tanks, and settling tanks, for example.

Result†: Filtration plants requiring only ¼ the space of sand plants of equal capacity. Capital costs cut almost in half—savings of up to 45%.

Here's why. Celite diatomite filters better than any other medium. Every cubic inch of the skeletal diatomite particles contains millions of microscopic filter pores. These are so minute they re-


move all suspended solids, including amoebae and algae, without flocculation.

Mined by Johns-Manville from the world's purest commercially available diatomite deposit, Celite is carefully processed for uniformity. You have a wide choice of grades for best balance of clarity and flow rate. For further information, call your nearby J-M Celite engineer. Write direct for free technical reprints and illustrated brochure. Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

* Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

† See *Comparison Studies of Diatomite and Sand Filtration* by G. R. Bell, Journal American Water Works Association, September, 1956, or write for free reprint.

JOHNS-MANVILLE 



When your work season begins next spring, be all set to start making money with new International rigs like these—the T-340 crawler and the 340 Utility.

Get set for '60... your IH dealer will pay you cash to deal now!



**Your IH dealer
pays you interest
at 6%
on your
down payment
or trade-in!**

It will pay you to be an Early Trader! For a limited time only, your IH dealer will pay you good, hard cash to deal NOW. By dealing now you:

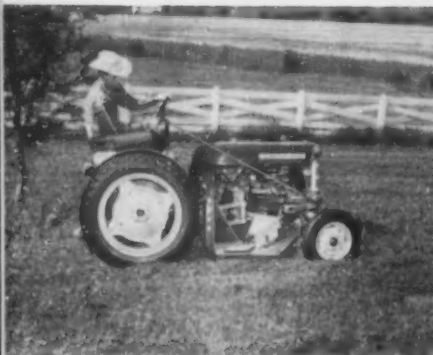
- 1. Earn interest at the rate of 6% on your trade-in, payable immediately in cash.**
- 2. Earn interest at the rate of 6% on your cash payments—either down payment or full cash settlement—payable immediately in cash.**
- 3. Get more for your trade-in** because your IH dealer wants used equipment now, while he still has plenty of time to recondition it.
- 4. Protect yourself against possible price increases** between now and specified dates next spring.
- 5. Obtain financing on time sales** to meet your personal situation.
- 6. Assure yourself that you will get delivery of the IH industrial wheel or utility crawler tractor and equipment you need, when you need it.**

**You have the jobs... Your IH dealer
has the power and equipment to match...**

Earn an Early Trader's Bonus



Smooth, 6-cylinder power, combined with 4,840 pounds of built-in brawn, give you high-capacity trenching, loading, and backfilling with the 61-hp International 460 Utility.



No other tractor does so much, at such low cost, on so many types of jobs as the International Cub® Lo-Boy.® Here it is with 60-inch International Danco rotary mower.

From mowing to snow removal is all in the year's work for the 13.4 hp International Cub Lo-Boy. The Lo-Boy is shown below, with 54-inch IH front-mounted blade.



The husky 45 hp International 340 has the built-in strength and stamina for heavy-duty landscaping, trenching, and materials handling. It leads its power class in fuel economy, too.

It's materials handling unlimited with a heavy-duty front end loader equipped with fork lift attachment. It easily interchanges with crane boom or materials bucket.



Unusual earthmoving versatility is provided by the International Danuser Terra-Scoop with hydraulically-controlled scarifying, loading, dumping, and spreading action.

Mow an 8-foot strip, on slopes as steep as 2 to 1, at 5 mph or faster! You can do it with an International Danco center-mounted mower on the rugged IH F-460 tractor.



on rigs like these...and many more!



The 45 hp International Drott T-340 Four-In-One combines a $\frac{3}{4}$ -yd bucket, a scraper, a clamshell, and a dozer all in one machine. Handles jobs no single-purpose rigs can do.



For low-cost operation, the 38.5 hp International 240 Utility, shown with International Wagner loader and International No. 23 side-mounted cutter bar mower, is tops.

Up to $\frac{1}{3}$ cu yd bites speed trenching with the big, 72 hp International 560 tractor, shown here with International Pippin heavy-duty backhoe and loader with $\frac{3}{4}$ cu yd bucket.



**On wheels or tracks
the most complete line of
utility power and equipment
is at your IH Dealer**

Cash in hand can be yours on the *exact size* of utility power you want, when you go to your IH Dealer for an Early Trader's Bonus deal! With seven sizes of wheel tractors, rated from 13.4 to 95 hp, and the 45-hp T-340 crawler, your IH dealer is headquarters for *job-matched* power. You don't have to pay for a bigger tractor than you need, nor slow down your jobs with an under-powered rig! For each model, there's a broad line of bonus-earning, matched equipment. Each unit-engineered machine gives top capacity, performance, and dependability with its matching International® tractor.

You've everything to gain, nothing to lose by having your IH dealer figure your deal *today* . . . the sooner you deal, the bigger your bonus!



**The earlier
you trade
the more
you save . . .**



Deal now...save 3 ways...

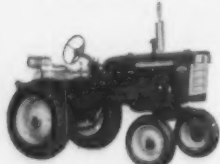
**on all your 1960 utility tractor
and equipment needs**

1. Big cash savings now

Buy now. Collect an Early Trader's cash Bonus. Trade in used machines and collect interest at the rate of 6% for a specified period of time on the value of the trade-in and any cash payments you make. This offer good for a limited time only. The sooner you trade, the more you save.



**International Cub
Lo-Boy, 13.4 hp***



**International 140,
28.25 hp***

2. The right size power at the right price!

Only International offers such a diversified range of utility power and equipment to meet your job needs. Power from 13.4* to 95 hp*, with unit-engineered equipment, insures long, dependable, full-capacity operation.

*Maximum flywheel hp at standard sea level conditions.



**International 240 Utility,
38.5 hp***



**International 340 Utility,
45.25 hp***



**International 460 Utility, 61 hp*,
gasoline, Diesel, LP Gas**



**International 560, 72.5 hp*,
gasoline, Diesel, LP Gas**



**International 660, 95 hp*,
gasoline, Diesel, LP Gas**

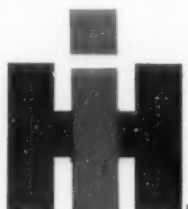


**International T-340 Crawler,
45 hp***

3. Backed by the industry's quickest available service

Only International offers you such readily available help for your parts and service needs. No matter where your job is located, one of a nationwide network of 5,000 dealers is nearby. He has well-equipped service facilities, a substantial supply of parts, and factory-trained mechanics. His parts department in turn, is backed by the industry's most extensive network of factory parts depots.

Big Early Trader's Bonus cash savings are available NOW on all the International tractors illustrated above. You also get a bonus on International Pippin and International Wagner backhoes and loaders; International Drott T-340 4-in-1; International Danuser blades, scoops, and scraper-scarifiers; and International Danco heavy-duty, center-mounted mowers. There's an IH Dealer near you—see him now for full Early Trader's Bonus Plan details!



See your

**INTERNATIONAL
HARVESTER**

dealer

International Harvester Products pay for themselves in use... Farm Tractors and Equipment... Trains... Industrial Wheel Tractors... Motor Trucks... Construction Equipment—Chicago 1, Illinois.

International Harvester reserves the right to withdraw its Early Trader's Bonus at any time, and will assume no obligation for orders executed under the plan after that date.

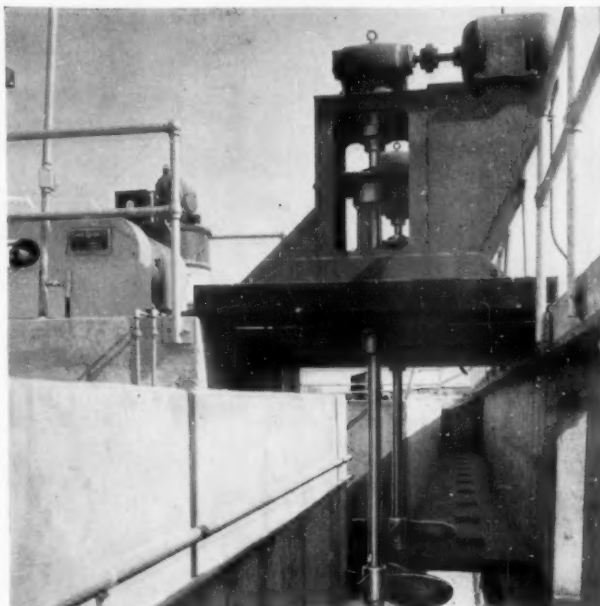
WHICH MIXING EQUIPMENT

provides most efficient flocculation?

LINK-BELT's combination of flash and straightline mixers assures chemical savings of 30 to 40% . . . increases filter runs by 50% . . . decreases wash water demands

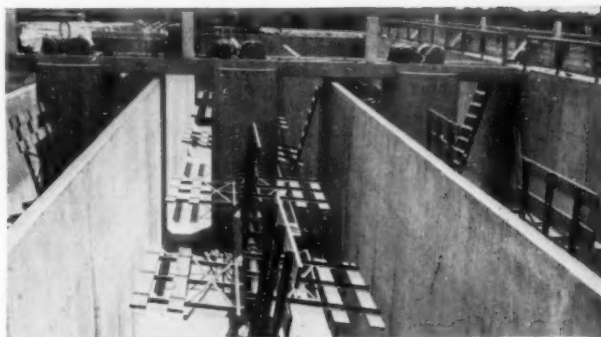
FLASH MIXERS PROVIDE RAPID, THOROUGH

MIXING of chemicals with water, sewage or industrial liquids. They consist of a constant-speed motor directly connected to a quiet-operating worm gear reducer. This drive, mounted on a pedestal, is connected to a vertical propeller shaft so mounted that *underwater bearings are not required*. Load and thrust of the propeller shaft are taken up by bearings in the pedestal so these forces do not act on the reducer bearings. This efficient design assures long life and trouble-free operation. The propeller itself is an iron casting designed for high mixing efficiency with low horsepower requirements. Link-Belt flash mixers may be installed in concrete, steel or wood tanks by mounting on a steel or concrete platform spanning the tank walls.



STRAIGHTLINE MIXERS PROVIDE GENTLE

SLOW MIXING to build up maximum size floc. These mixers consist of a number of sections, each made of a horizontal solid steel shaft carrying steel angle arms on which redwood paddles are mounted. The paddle shaft is driven by a chain drive from a Link-Belt Electrofluid drive coupled to a Link-Belt P.I.V. variable speed drive. The solid steel paddle shaft, with rigid compression couplings insuring perfect shaft alignment, turns in special babbitted bearings with water lubrication grooves. These bearings eliminate grease contamination of the water and prevent breakdown that may be caused by failure to provide proper lubrication. Use of redwood for paddles eliminates painting maintenance. Link-Belt makes a complete line of these mixers. Size and shape can be adapted to suit local requirements.



The mixers shown above are part of the broad line of Link-Belt sanitary engineering equipment. Get in touch with the Link-Belt office nearest you. Our sanitary engineers will be glad to work with your engineers, chemists and consultants . . . help you get the finest in modern treatment methods. Or write for your copy of Equipment for Chemical Flocculation Book 2442.



LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. Sanitary Engineering Regional Offices—Colmar, Pa., Chicago 9, Kansas City 8, Mo., San Francisco 24. Sales Offices in All Principal Cities. Export Office, New York 7. Representatives Throughout the World.

19,011



BASIC...

FOUNTAIN OF YOUTH, 1880... The well of the Little Red Schoolhouse was a popular, if not always healthful, gathering place for children. The old tin dipper in its lip-to-lip travels carried more than its share of disease.



THE MODERN DRINKING FOUNTAIN... eliminates the community cup...substitutes for it clean, pure, safe water distributed nationwide over a network of dependable cast iron pipe.

U.S.
PIPE

**FOR WATER, SEWERAGE AND
U. S. PIPE AND FOUNDRY COMPANY**

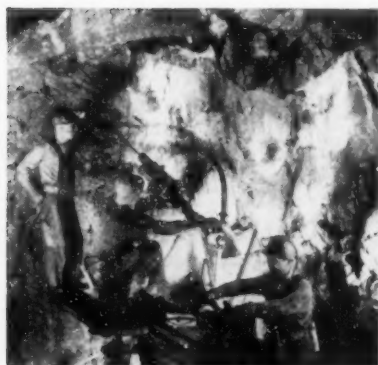
but better than ever today!

***Care and precision from mine to main
insure U. S. Pipe quality***

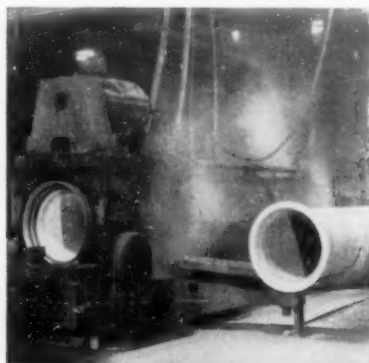
The nation's health depends largely on water. And most of this water is distributed through cast iron pipe.

U. S. Pipe, therefore, exerts every effort to make its product dependable, long-lived and trouble free. From mining of ore... through blast furnace... to final shipping, every length of U. S. Cast Iron Pipe is checked and rechecked for quality.

This end-to-end supervision is another reason U. S. Pipe measures up to the promises made for it... and to the responsibilities placed on it in service.



QUALITY BEGINS HERE . . . at one of U. S. Pipe's mines near Birmingham where ore is mined.



PIPE NEWLY CAST . . . 24" diameter and 18 feet long rolls out on skids from centrifugal casting machine.



SCIENTIFIC TESTING . . . Determining the chemical properties of U. S. Pipe, one of many quality checks.

INDUSTRIAL SERVICE



Birmingham 2, Ala. *A wholly integrated producer from mines and blast furnaces to finished pipe.*

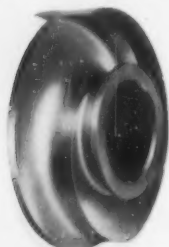
AURORA® CONTROLLED PERFORMANCE



MONO-VANE

NON-CLOG PUMPS

"The Pump with the single passage impeller"



MONO-VANE
IMPELLER

- CAPACITIES TO 1000 G.P.M.
- HEADS TO 150 FT.
- BALANCED IMPELLER
- HORIZONTAL OR VERTICAL
- RUGGED CONSTRUCTION
- PROVEN DEPENDABILITY
- MINIMIZED WEAR
- FAST INSTALLATION
- EASY MAINTENANCE

The Mono-Vane impeller is in hydraulic and dynamic balance. It can be trimmed to suit various head and capacity requirements and still retain proper balance. The AURORA Non-Clog Pump is ideal for handling long stringy materials. Smooth, quiet operation is assured with the Mono-Vane impeller which is always in dynamic and hydraulic balance—even when trimmed to accommodate various head and capacity requirements. Single passage impeller design makes the AURORA Non-Clog pump ideal for handling long stringy materials. The discharge may be turned to any position to facilitate installation, service and maintenance. Clean-out cover is located in casing to provide easy service access.

Typical applications: elevating sewage, pumping sludge, handling heavy settleable solids, effluent, and other wastes and industrial by-products.

WRITE FOR BULLETIN 121 MV

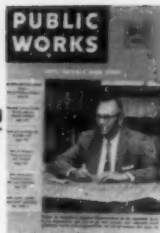


AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY

630 LOUCKS STREET • AURORA • ILLINOIS



LOCAL DISTRIBUTOR IS LISTED IN THE YELLOW PAGES OF YOUR PHONE BOOK



LeRoy Winfield Van Kleeck is principal sanitary engineer in charge of the Hartford metropolitan area office of Bowe, Albertson & Associates, consulting engineers of New York City. He was born in Middletown, New York, in 1904, graduated with honors in civil and sanitary engineering from Lafayette College in 1927, after which he worked on water supply with the Massachusetts Department of Public Health. From 1930 to November 1959 he was associated with the Connecticut State Department of Health and at the time of his resignation Mr. Van Kleeck was principal sanitary engineer in charge of the radiological, sewage and refuse disposal sections.

Mr. Van Kleeck is a member of the American Academy of Sanitary Engineers, the New England Sewage and Industrial Wastes Association, the Federation of Sewage and Industrial Wastes Associations, the American Society of Civil Engineers and is a registered professional engineer. As a member of the NESIWA, he served on the Executive Board for 14 years, was secretary-treasurer for 6 years, and president in 1948. His contributions to the FSIWA have been many, including technical papers, committee assignments and several terms as director on the Board of Control. In 1946, he received the George Bradley Gascoigne award, in 1948 the Charles Alvin Emerson award and in 1950 the Arthur Sidney Bedell award—all from the Federation.

Mr. Van Kleeck is married and lives in Avon, Connecticut. Among Van's hobbies are gardening, forestry, insect study, model railroading, photography and strangely, technical writing.



Announcing a New FERRIC SULFATE PLANT



These new facilities now in operation at Copperhill, Tennessee substantially increase our production of Ferri-Floc and will permit us to supply the increased demands for this superior coagulant at all times.



THE COAGULANT WITH THE PLUS FEATURES

<i>Excellent Taste and Odor Control</i>	<i>Turbidity Removal</i>
<i>Increased Filter runs</i>	<i>Manganese and Silical Removal</i>
<i>Coagulation over Wide pH range</i>	<i>Bacteria Removal</i>
<i>Rapid Floc Formation</i>	<i>Ease of Operation</i>
<i>Efficient and Economical</i>	

AVAILABLE IN BULK, AND ALSO IN DOUBLE LINED POLYETHYLENE BAGS AT NO EXTRA COST.

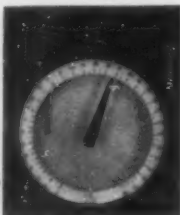
FREE BOOKLET — We will send you, without charge, a 38 page booklet that deals specifically with all phases of coagulation — Just make request on your firm's letterhead.



TENNESSEE CORPORATION
615-629 Grant Building, Atlanta 3, Georgia

New Item . . . RTM ROTO-TROL

Multi-
Circuit
Pump
Controller



- Recording and Indication when Desired
- Suppressed Head Type
- Any Distance between Transmitter & Receiver

The RTM Roto-Trol operates on the time impulse principle. A tested and proved switching mechanism is operated by a powerful dual motor drive. The motor starters can be controlled direct from the heavy duty mercury switches.

Write for New Bulletin RTM

HEALY-RUFF Company

791 Hampden Ave., St. Paul 14, Minn.



Pay the man
his \$40 for new
bearings for the
last time! THEN BUY
THE ALL NEW...

SOLO CONCRETE VIBRATOR

The only NEW DEVELOPMENT IN CONCRETE VIBRATORS IN 25 YEARS! 25,000 V.P.M.—"higher than hi-cycle"—this one man tool saves you \$25 per day. It eliminates eccentric bearings and puts the \$40.00 per 100 hours you normally pay for bearing replacement right back in your pocket.

Write for free demonstration. There's a PM Field Engineer near you.

Pacific
Mercury

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North Hollywood 9, Calif.

Manufacturers of the Thomas Electronic Organ



ALGAE IN WATER SUPPLIES

This is an illustrated manual "on the identification, significance and control of algae in water supplies." In it are six color plates showing algae important to the water works man. These color plates are the ones that appeared originally in *PUBLIC WORKS* in 1955. In addition there are numerous line drawings and photographs. There are chapters on significance of algae, and on their identification, with a key and glossary in the appendix. There are individual chapters on algae responsible for taste and odor and for filter clogging; on polluted water and clean water algae and on allied matters. A chapter is devoted to procedures for the enumeration of algae and another on control. A bibliography and a genus and species index are provided.

This is a very fine text of 88 pages. It was prepared by C. Mervin Palmer in charge of Interference Organisms Studies at the Robert A. Taft Sanitary Engineering Center. There is an introduction by Clarence M. Tarzwell, Chief of Aquatic Biology at the Center. The illustrations of algae in color are by Harold J. Walter and the cover design of the book is by Judith A. Walters. Robert T. Hyde was responsible for the editing and layout. This very fine addition to any library (*Public Health Service Publication No. 657, 1959*) is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at \$1 per copy.

INDUSTRIAL WASTE ORDINANCES AND REGULATIONS

Municipal officials who are considering the adoption or revision of regulations and surcharges for the acceptance of industrial-waste discharges will find a valuable guide in a 20-page report entitled "Guide-Lines for Drafting a Municipal Ordinance on Industrial - Waste Regulations and Surcharges." This was prepared by Dr. Edward J. Cleary, executive director and chief

engineer of the Ohio River Valley Sanitation Commission. Recognizing that no municipal ordinance has universal application, the manual has been organized to include reasons why certain provisions are recommended, and to outline how they may be incorporated into the ordinance. Among the topics covered are: Admission of industrial wastes into public sewers, prohibited discharges, control of admissible water, industrial waste surcharges, billing, penalties and validation. Copies from the American Public Works Association, 1313 East 60th Street, Chicago 37 Illinois, at \$3.00.

FREEZING & THAWING TESTS FOR CONCRETE

A cooperative program of freezing and thawing tests of concrete specimens was conducted by 13 laboratories using the four ASTM tentative methods of test. Three concrete mixtures were used, involving different aggregates and two different air contents. Large variations in durability were found. This report presents a statistical examination of the data, with rather lengthy conclusions and summary. An appendix contains suggested operating procedures for comparative tests. Special Report No. 47; 67 pages; \$1.60. Highway Research Board, Washington 25, D. C.

CALCIUM CHLORIDE IN CONCRETE

A 40-page technical manual on "Calcium Chloride in Concrete" contains data on major effects of calcium chloride, early and ultimate strength, cold weather protection, high early strength cement and air entrained concrete. There is a section on special conditions where calcium chloride is used advantageously—and there are several specifications in the booklet. Charts illustrate laboratory data from numerous nationally recognized technical organizations. Single copies are free from the Calcium Chloride Institute, Ring Building, Washington 6, D. C.

STREET CLEANING PRACTICE

This is a fine book on a subject that has scarcely been given the attention it deserves. It is thorough and complete as would be expected, considering the authors: Paul Screvane, D. A. Anderson, James Brophy, John E. Cassreino, Sr., Hugo Erikson, James Martinek, J. J. Sullivan and Murphy Snoderly, assisted by Richard Fenton.

Though the introduction says that

WHEN CITIES PLAN INDUSTRIAL GROWTH

*it pays to specify **Vitrified Clay Pipe***

SANTA PAULA, CALIFORNIA, already a bustling center of agricultural activity, is building to share in California's phenomenal industrial growth. To accommodate new industry and meet the needs of a growing population, Santa Paula recently completed a bond-financed sewer expansion project, using Vitrified Clay Pipe exclusively. Over 6 miles of Vitrified Clay Pipe were installed.

Like Santa Paula, growing communities everywhere need the permanence and safety that only Clay Pipe can provide. Clay Pipe is the only pipe

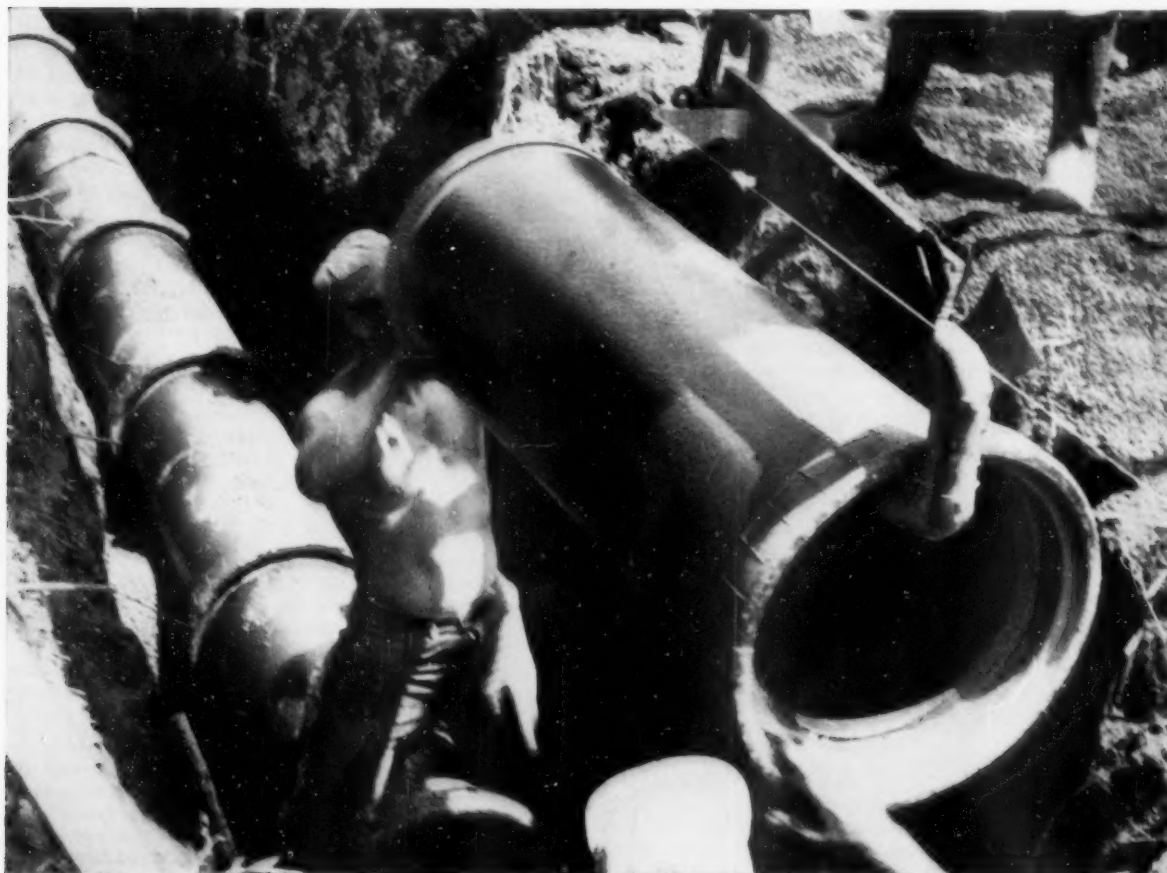
that never wears out . . . does not rust, rot, corrode, or crumble. And with its new research-developed, factory-made joints, Clay Pipe is faster and easier to install than ever before.

When your community plans new sewerage facilities, be sure to consider the exceptional advantages of Clay Pipe. Its exclusive long-term guarantee is your assurance of permanent, maintenance-free service. Only Clay Pipe has *all* the features you can trust to handle industrial growth.

CITY OFFICIALS: James E. Leary, Mayor; Edwin C. Bixby, Ernest H. Oman, Ralph B. Crawford, Reece B. McCalister, Councilmen.

CONSULTING ENGINEERS: J. M. Montgomery Engineering Co.

CONTRACTOR: N. P. Van Valkenburgh Co.



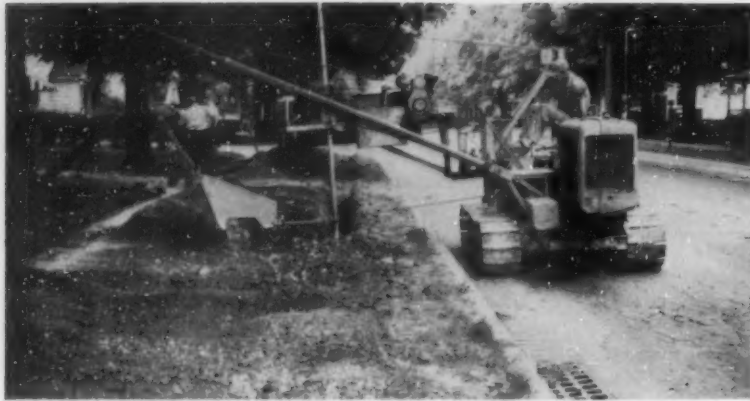
C-159-2-A

Vitrified

CLAY PIPE

Never Wears Out

NATIONAL CLAY PIPE MANUFACTURERS, INC. 1820 N Street, N. W., Washington 6, D.C.
311 High Long Bldg., S E. Long St., Columbus 15, Ohio • 703 Ninth & Hill Bldg., Los Angeles 15, California • Box 172, Barrington, Illinois • 1401 Peachtree St., N. E., Atlanta 9, Georgia

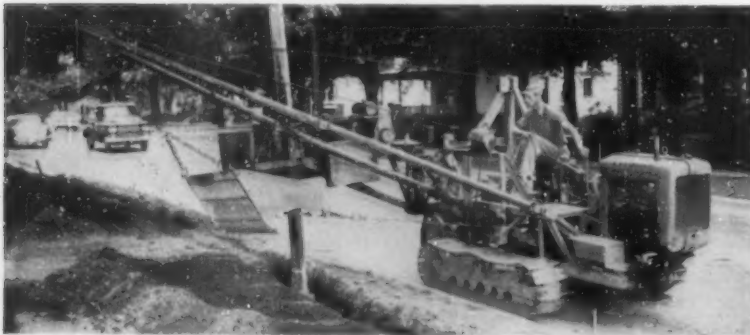


Job photos don't lie . . .

See from these photos how the Cleveland 80W's ability to pull backfill into trench permitted spoil to be placed off the street, away from the curb—no blocked-up catch basins, no need to lift backfill over curb, no interference with traffic (good public relations!). Note also how the one-man-operated 80W first backfilled and tamped driveways, making them ready for immediate use (more good public relations!) then backfilled and tamped the rest of the trench.

but they tell only part of the CLEVELAND 80W story

But you've got to see the 80W in action to really appreciate it—a cost-cutting versatile machine that fits so many different underground construction jobs. It handles and lays pipe—sets valves and hydrants—pulls street crossings—backfills fast from either side of trench, toward or away from itself—simultaneously tamps fill to the most rigid specifications—does a complete clean-up job.



The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO



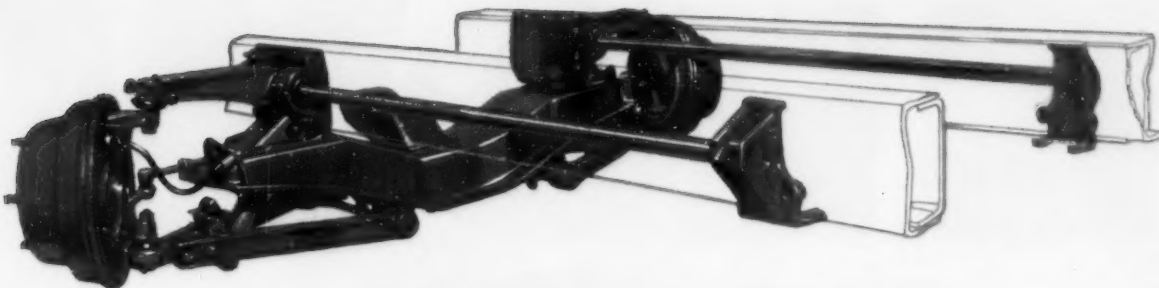
this is a completely revised edition of a book published in 1938 under the direction of APWA's predecessor organizations, it is in reality a new text and a very good one. It covers such subjects as local conditions affecting street cleaning; methods and equipment; planning cleaning operations; the prevention of street dirt through anti-littering campaigns and other means; such special problems as leaves, trees, unimproved streets, weeds, sidewalks and vacant lots, soot and fly ash, and many others; catch basin and inlet cleaning; snow and ice control and removal; the organization of the street cleaning agency; and management problems relating to personnel, equipment, budgets, records, and costs.

A 69-page appendix of tables summarizes data on the street cleaning practices of 100 cities in the United States and Canada, selected according to population, geographical location, and the completeness of the information they provided, to insure a cross section of typical current practices. Another appendix gives the provisions of typical ordinances relating to parking, littering, sidewalk cleaning, snow clearing, and other problems.

Street Cleaning Practice was prepared by the Street Sanitation Committee, American Public Works Association, 1313 East 60th Street, Chicago 37, Ill.; 424 pp.; cloth; indexed; illustrated; selected bibliography. \$7.

FIRST INTERNATIONAL SKID PREVENTION CONFERENCE

The proceedings of the First International Skid Prevention Conference are now available. This 600-page publication is arranged in two parts and contains a total of 59 papers with discussions: The papers cover the following areas: Kinds of skidding and accidents involving skidding; the human element in skidding; relationship of vehicle dynamics to skidding; the relationship of tire design and composition to skidding; laboratory and field methods of measuring road surface friction; the relationship of road surface properties to skidding; and a comparison of several methods of measuring road surface friction. In addition it contains the reports of the five Conference subcommittees which set forth the latest findings and recommendations in the area listed above. These Proceedings may be obtained for \$10 per copy from the Virginia Council of Highway Investigation and Research, Box 3817, University Station, Charlottesville, Va.



CHEVROLET'S REVOLUTIONARY TORSION-SPRING RIDE

the most significant new truck development in decades!

Years of intensive engineering achieved a revolutionary result—a totally new truck suspension system. The most exhaustive chassis engineering program in trucking history proved conclusively that, from the standpoints of both ride and durability, the finest possible truck suspension system would consist of independently suspended front wheels with torsion bar springing. Advancing on this principle, Chevrolet engineers proceeded through years of development to produce a completely new system for the 1960 Chevrolet truck product.

New Torsion-Spring Ride—how it works. The revolutionary result of Chevy's all-out engineering effort—Torsion-Spring Ride—eliminates both the old-fashioned I-beam front axle and friction-producing front leaf springs. Each front wheel, suspended independently of the other through tough control arms and low-friction linkage, is free to step cleanly over bumps without jarring the entire truck. Also, friction-free torsion bars on either side of the chassis, specially mounted to provide a twisting action, work to absorb each jolt; they flex freely to soak up all kinds of shocks, from the smallest to the most severe.

Three new rear suspensions, tough and tailored to the truck, are completely redesigned to complement



M70 tandem proves its stamina on year-long test of durability.

the independent front suspension in every weight class.

Here's a ride that lets you get more work done in a day's time! Take a '60 Chevrolet truck over a rough stretch of back road and feel the absence of I-beam shimmy and wheel fight. Chevy's torsion springs soak up jolts and jars that would shake the headlights off an ordinary I-beam rig. You move along with maximum payloads at higher safe cruising speeds. You make your tough off-the-highway runs in less time, improving your ton-mile-

per-hour rate as much as 100%.

A ride that shows respect for the driver and the load! Out at the GM Proving Ground, the test drivers will take a torsion-spring Chevy any day over an I-beam truck—even if they have to drive it twice as far. The ride's that much better; that much safer. The load, too, has an easier time of it. There's far less bounce and jounce, less danger of damaging fragile cargoes.

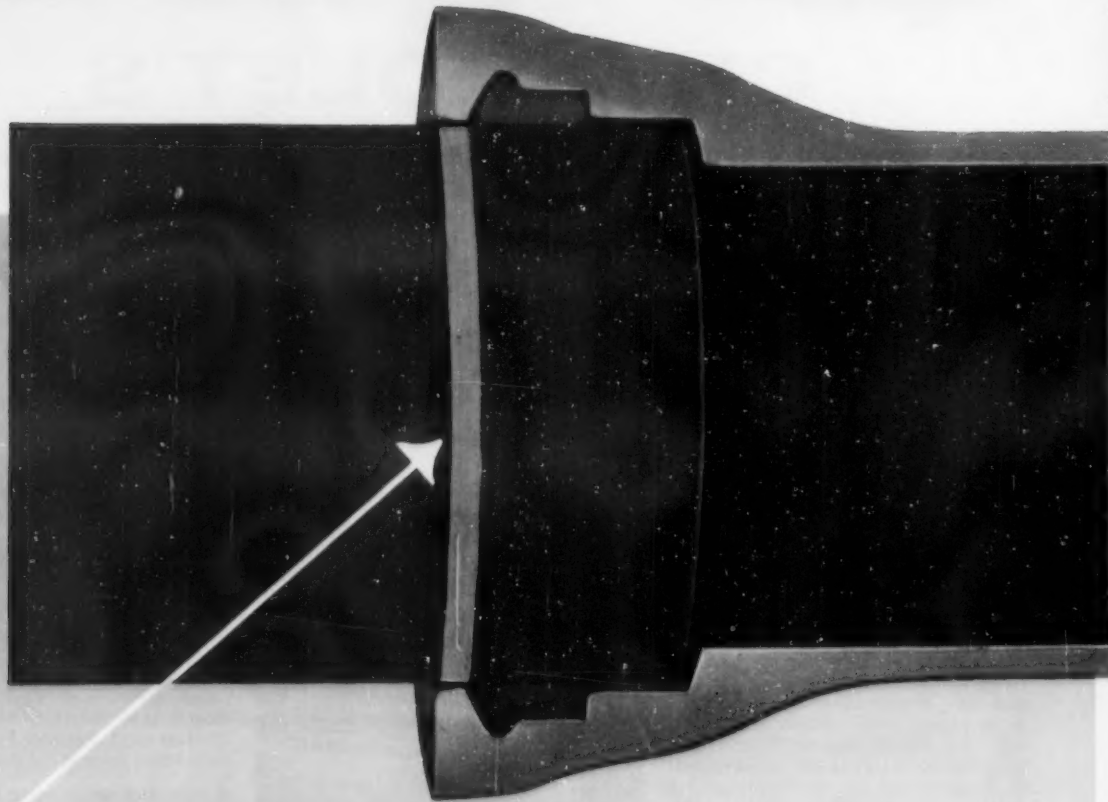
A ride that adds extra thousands of miles to the truck's working life! You can be sure the shockproof action of Chevrolet torsion-spring ride means lower maintenance costs. As much as 78% of all objectionable road shock and vibration is absorbed before it can be transmitted to the truck's body and sheet metal. Chevy trucks stay new-looking a whole lot longer and their working life is increased by extra thousands of miles.

Once you've experienced the incredible smoothness of a torsion-spring ride, you'll realize that Chevrolet has set off a full-scale revolution with the introduction of its '60 models. By throwing away the old-fashioned I-beam in favor of independent front suspension, Chevy's new design has improved virtually all phases of truck performance. Drive a new one just once. That's all we ask. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

1960 CHEVROLET STURDI-BILT TRUCKS



CLOW



This YELLOW STRIPE on
CLOW Bell-Tite Joint Pipe
is your guide line to a quick bottle-tight seal

This circular yellow stripe is painted on the plain end of each length of CLOW Bell-Tite Joint pipe. It serves as a guide in making up the joint, to provide a fast, positive visual check that the joint is completely and correctly assembled.

The edge of the stripe farthest from the plain end measures approximately one-half inch less than the depth of the Bell-Tite bell.

Thus, in assembly, the joint is made pressure-tight when the stripe is no longer visible.

The seal is achieved by the use of a single, thick-section, high durometer molded rubber gasket. When compressed in position by the entering plain end of pipe, it forms a pressure-tight seal with generous sealing area which permits ample deflection to meet casual curves or grades.

**CAST
IRON**

PIPE



with patented* Bell-Tite Joint

*Patent No. 2898131

MORE MAIN FOR YOUR MONEY

Costs less to buy

Only one accessory is required to make a pressure-tight seal with a CLOW Bell-Tite Joint—a single, molded rubber gasket. There are no extras—no bolts, no nuts, no followers, no couplings. This economical pipe is strong, tough, uniform and durable for long-life underground service. It is available in any specified thickness or weight class in accordance with ASA, AWWA, or Federal specifications from 3" to 24".

Costs less to install

Assembly is quick, simple and easy. Pressure-tight joint is formed instantly by merely inserting the rubber gasket and pushing the pipe home to its seat. It can be installed in a wet trench and even under water. Rate of installation usually is limited only by speed of excavation. It permits ample deflection for casual curves or grades. Bell-Tite Joint pipe is Underwriters' Listed for working pressures up to 350 psi. Available in diameters up to 24".



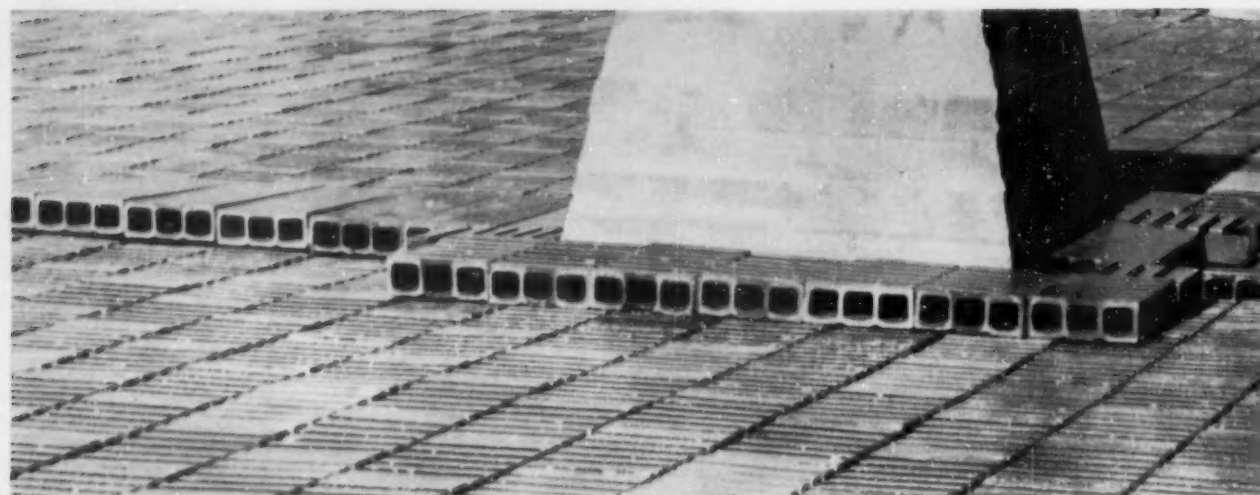
JAMES B. CLOW & SONS, INC.

201-299 North Talman Avenue, Chicago 80, Illinois

Subsidiaries:

Eddy Valve Company
Waterford, N.Y.

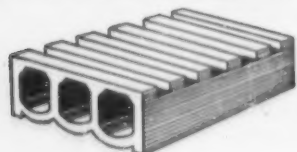
Iowa Valve Company
Oskaloosa, Iowa



for Winning the War *Plan Trickling Filters with* **TFFI SPECIFICATION VITRIFIED CLAY UNDERDRAIN FLOOR BLOCKS**

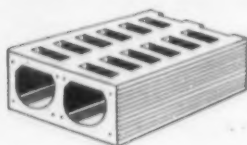
The swing to trickling filters for sewage and wastes treatment has grown dramatic. Since 1945, 926 trickling filters—most of them with vitrified clay floor blocks—have been built, contributing by far the major share in pollution control. Their reliability and adaptability is emphasized by the fact that many trickling filters are operating as well today as they did when first installed thirty and more years ago. Much of the proven success of these filters is due to their increasing use of vitrified clay underdrain blocks in their floors, as made by members of this Institute.

TRICKLING FILTER



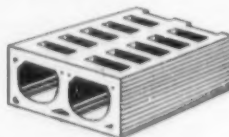
TRANSLOT

Texas Vitrified Pipe Co.
Mineral Wells, Texas



ARMCRE

Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



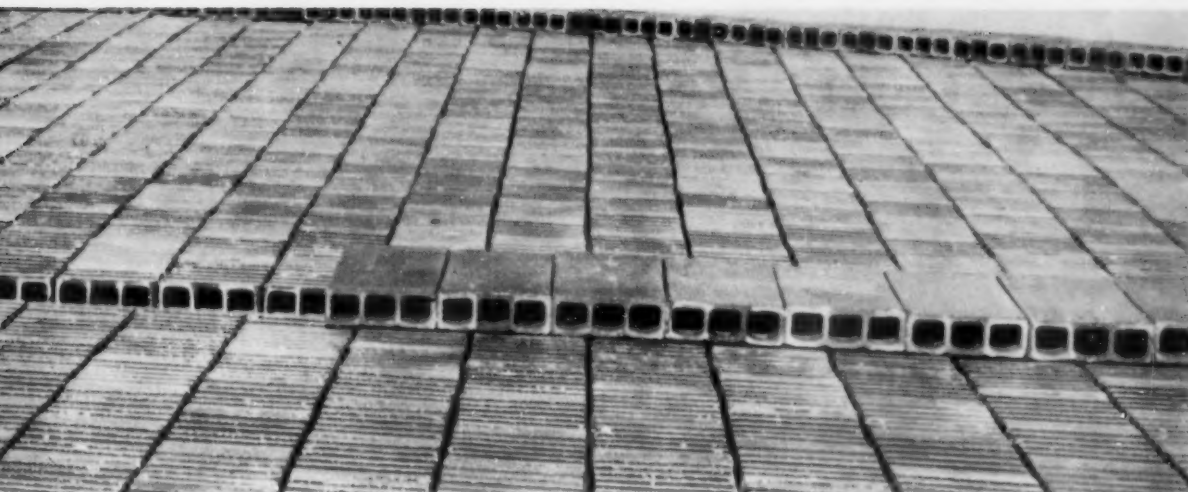
BOSCO

Bowenston Shale Co.
Bowenston, Ohio



NATCO

Pittsburgh 22, Pa.
327 Fifth Ave.
Natco Corporation



on Stream Pollution...

Failed underdrains of some substitute material can far more than eat up any "savings" in first cost. The real cost of a filter floor is its final cost, and that's where TFFI Specification vitrified clay floors lower cost as well as lengthen life. For they alone are made in modern plants under rigid controls of quality that are impossible with any substitute material. Only vitrified clay blocks offer you a 50-Year Guarantee against all ravages of acids, alkalis and bacteria.

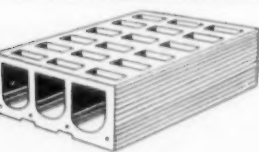
Other Advantages

Other advantages of Trickling Filters with vitrified floor blocks are: they safely carry highest hydraulic loadings, afford low initial cost, low operating and maintenance costs. Overloads are no problem and operating personnel is held to an economical minimum.

Helping End Stream Pollution

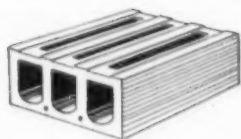
The TFFI takes pride in its important contribution toward clean waters in America. Over 2,682 sewage works with trickling filters now serve over 35% of our population.

FLOOR INSTITUTE



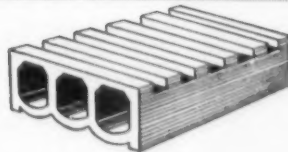
DICKEY

W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.



POMONA

Pomona Terra-Cotta Co.
Pomona, No. Car.



TRANSLOT

Cannelton Sewer Pipe Co.
Cannelton, Ind.

**engine
power**
BY CATERPILLAR

NEW

Caterpillar announces the D320—a high performance, lightweight, compact 120 HP Diesel Engine for $\frac{3}{4}$ yard excavators, small portable rock crushers, road rollers and 250 CFM rotary compressors. The D320 Electric Set is ideal for area lighting, standby and portable batching plants.

The Caterpillar D320 is a brand new four-cycle, four-cylinder, valve-in-head, precombustion chamber, turbo-charged diesel. It is the most modern package of 120 HP you can find to power your equipment. As an electric set, it gives you 40 KW in a compact configuration.

The D320 weighs in at only 1,300 pounds, is just 44" long, less than 28" wide and just 36" high. With these compact dimensions, you can easily install the D320 on present equipment. It may make it possible for you to raise equipment profitability with increased HP—even though space is limited and weight must be held down.

And of course you get traditional Caterpillar Engine dependability, operating economy, maintenance ease and long life. This is a *heavy-duty* engine in every way.

Your Caterpillar Dealer has a lot more information on the D320. It's profitable information to have if you're considering repowering, ordering new equipment, or if you're planning to add a 40 KW portable electric set. Ask your Dealer's Engine Specialist for complete specifications. Also, write us for more detailed facts, and let us know the kind and size equipment you have in mind.

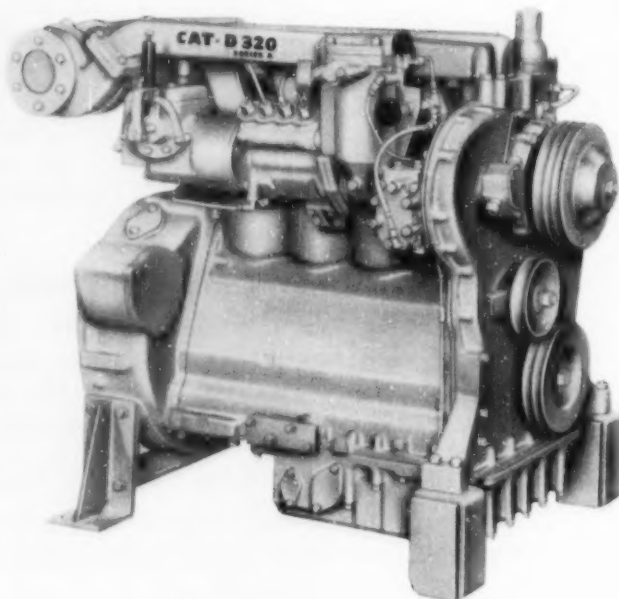
OTHER RATINGS

The ratings on this page are published as a general guide for world-wide use in a broad range of applications. Other ratings, yielding gains in performance and economic return, are available to meet the needs of particular applications when detailed information is submitted.

Less weight per HP—more engine in less space. Lightness and compactness minimize enclosure and undercarriage problems.

Ratings shown are for D320 with Turbo-charger and Aftercooler, which is added for maximum engine output.

Every Cat Engine is built to rigid Caterpillar standards and carefully tested prior to delivery. Workmanship and power output capacity are certified.



CATERPILLAR

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U.S.A.
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D320 HORSEPOWER RATINGS*

Maximum			
Output Capacity	120 HP	2400 RPM	
Intermittent	95 HP	2400 RPM	
Continuous	75 HP	2000 RPM	

* WITHOUT FAN



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There's More than One Way to Dig a Trench

318. Arps Corporation lets you choose. The ARPS tractor-mounted Trench Hog makes it cheaper, better to own your own trencher. Digs to 7 feet deep, 20" wide. Trench-Devil M-A has 7 appealing new features. Smaller Trench-Devil Jr. keeps you from sending a man to do a boy's work. Write Arps Corp., New Holstein, Wis., or check the card for bulletins.

Never Mind Your Lagoon Depth

326. If you want to get air into any aeration basin or lagoon the "VORTAIR" Aerator will do it. It's no power hog, either. Dissolves 2.5 to 3 lbs. of oxygen per hour per hp. Bulletin 6620 from Infilco Inc., Tucson, Ariz., or check card.

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333. . . . of hanging traffic signs and signals to overhead cables with the simple UNABRAC. Adjustable, economical, approved. National Bracket Co., 969 W. Wilson St., Salem, Ohio, or check the card.

Link-Belt Has Learned a Lot

334. . . . in the past 24 years about Circu-line Sludge Collectors. This knowledge is now yours in book No. 2546, to complete your 2650 Link-Belt Sanitary Engineering Binder and help you to better sedimentation. Write Link-Belt Co., Colmar, Pa., or check the card.

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362. Just how is discussed in a new 32-page booklet, packed with pictures, and practical procedure suggestions. Address Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill., or check the card.

Handbook on Sewage Lift Stations

377. "Design Criteria for Sewage Lift Stations," in Catalog No. 502, chock full of data you will need on factory-built underground pumping stations. Includes Bulletin 700 to complete what every consulting and municipal engineer, contractor and builder wants handy. Address Schmieg Industries Inc., Box 4701, Detroit 34, Mich.

Helps Solve Bridge Concrete Problems

363. Special aids for common problems of bridge designers and builders. Case histories, usual and unusual, are given in Bulletin MBR-P 11. Address The Master Builders Co., P R Dept., Cleveland 3, Ohio, or check the card.

Many Fuels Will Power Enterprise Engines

395. New bulletin tells of economies and advantages of the Enterprise Engine "Dual Fuel" system. Ideal for stationary power plants, sewage treatment plants, and pumping stations. Address Enterprise Engine & Machinery Co., 18th and Florida Sts., San Francisco 10, Calif.

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399. . . . Onan generating plants can step in to save the day—or night. New 1960 Onan Electric Plant Catalog is available, with full data for selecting the proper type plant for your particular needs. Write D. W. Onan & Sons, Inc., 2515 University Ave., SE., Minneapolis 14, Minn., or check our card.

Why Make "A Federal Project" of Sewage Treatment?

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Now "Shift on the Go"

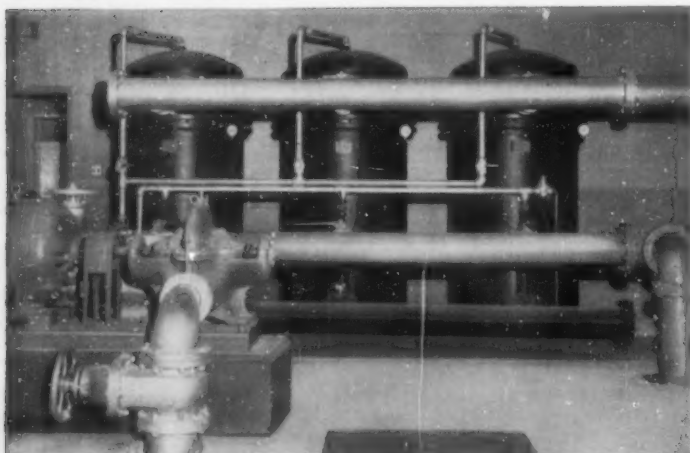
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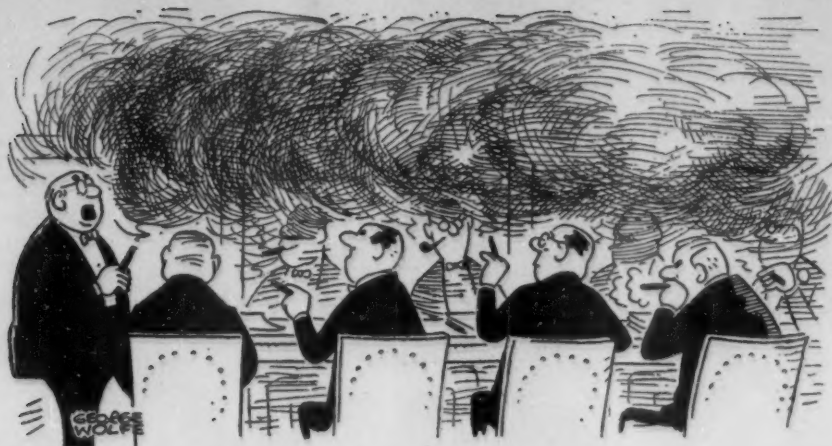
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Park Sheraton Hotel
New York, N. Y., Jan. 20-22, 1960

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Chicago, Ill., Jan. 24-28, 1960

Indiana Section, AWWA

Sheraton-Lincoln Hotel
Indianapolis, Ind., Feb. 3-5, 1960

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Pick-Congress Hotel
Chicago, Ill., Mar. 16-18, 1960

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Statler Hotel
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Hotel Pritchard
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Mar. 23-24, 1960

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Bellvue-Stratford
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Nebraska Section, AWWA

Cornhusker Hotel
Lincoln, Nebr., Apr. 20-22, 1960

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Monterey, Calif., Apr. 22, 1960

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Billings, Mont., Apr. 28-30, 1960

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Portland, Ore., May 4-6, 1960

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Central States Section, FSIWA

Lorraine Hotel
Madison, Wisc., June 15-17, 1960

Institute of Traffic Engineers

Edgewater Beach Hotel
Chicago, Ill., Sept. 11-15, 1960

Kentucky-Tennessee Section, FSIWA

Andrew Jackson Hotel
Knoxville, Tenn., Sept. 12-14, 1960

Missouri Section, FSIWA

Hotel Governor
Jefferson City, Mo., Sept. 25-27, 1960
Sept. 25-27, 1960

New York Section, AWWA

Whiteface Inn on Lake Placid
Whiteface, N. Y., Sept. 28-30, 1960

Federation of Sewage and Industrial Wastes Associations

Philadelphia Sheraton Hotel
Philadelphia, Pa., Oct. 2-6, 1960

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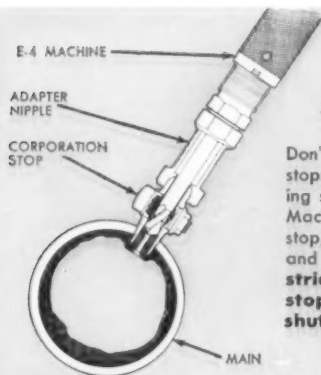
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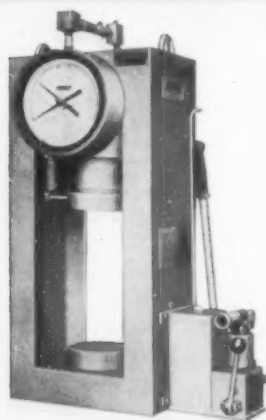
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Elevated Tanks and Other Storage Facilities

32. Specification sheet covering elevated tank sizes and design and illustrated brochure available from the Darby Corp., Kansas City 15, Kansas.

Handbook of Cast Iron Pipes and Fittings

32. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 14, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use in reference.

Use The Reply Card

How Eleven Cities Installed Water Meters

36. This 8-page bulletin describes the planning and operational procedures used by 11 water departments and companies in the installation of about 200,000 water meters. Check the reply card or write The Ford Meter Box Company, Inc., Wabash, Ind., for methods of installation and rate cards.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews and R. D. Wood fire hydrant and R. D. Wood gate valves.

Automatic Engine Control Equipment Manual

83. This catalog contains descriptions of standard automatic and semi-automatic controls and control equipment. General control recommendations, control selection chart, accessory selection chart, safety stop controls and alarm sets are sections covered. For price lists and models available write Synchro-Start Products, Inc., 8151 N. Ridgeway, Skokie, Ill.

Right Angle Gear Drive and Deep Well Turbine Pump

107. Applications, gear drive selection tables, pulley data, efficiencies and standard dimensions of Johnson right angle gear drives are covered in catalog from Johnson Gear & Mfg. Co., Ltd., Eighth and Parker Sts., Berkeley 10, Calif. Check the reply card.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Catalog on Industrial and Motor Controls

143. Catalog illustrates and describes B/W magnetic contactors, starters and reversing contactors, together with diagrams of enclosures and dimensions. Copies are available from B/W Controller Corp., 2211 East Maple Road, Birmingham, Mich., or check the reply card.

Guide Book Information for Emergency Power

153. This book covers what to do when commercial power fails in a fire, flood, hurricane, war and other national disasters. Check the reply card or write Caterpillar Tractor Co., Engine Div., Peoria, Ill., for a copy of "The Four Horsemen of the Space Age."

AWWA Fire Hydrants and Gate Valves

155. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

Valve and Hydrant Construction Details

161. A 72-page catalog-type bulletin, just completed, gives detailed data on construction and application of gate valves, check valves and hydrants for water works service. Write for Bulletin 5710 from Darling Valve and Mfg. Co., Williamsport, Pa., or check the reply card.

A Short Course in Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type-gasket make this booklet valuable to every engineer and contractor. Check the reply card.

Lay Water Mains Faster With "Fluid-Tite" Couplings

184. Get permanent water-tight joints automatically with K & M "Fluid-Tite" couplings for K & M asbestos-cement pressure pipe. Full details on this faster installation and self-energizing couplings are available from Kenabey & Mattison Co., Ambler, Penna.

Design of Prestressed Concrete Tanks

194. An 8-page technical Bulletin, T-19, on the Design of Prestressed Concrete Tanks, gives engineering data and formulas of general interest to anyone considering prestressed concrete for storage tanks. Check the reply card or write The Preload Co., Inc., 21 East 37th St., New York 16, N. Y.

Bell and Spigot Joint Leaks Quickly Repaired

214. Broken water main can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Leaky bell and spigot joints are made lastingly tight with Skinner-Seal Bell Joint Clamps. Get Skinner Catalog GW now—this handsome 48-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. M. B. Skinner & Co., South Bend 21, Ind.

Clow Bell-Tite Cast Iron Pipe

280. Laying water mains is easier, faster and more economical with Clow Bell-Tite joint cast iron pipe. Joint employs a single rubber gasket as the only accessory. Complete details available in illustrated literature from James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.



Contractor, Greenville, Pa.

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Fast Pickups with large loading area

Efficiency Unequalled

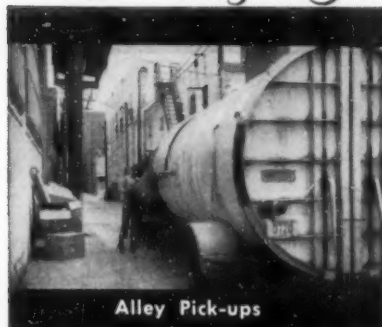
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Dense Heavy Loads



Fast, Easy Maintenance



Culver City, Calif. PAK-MORS

To order these helpful booklets check the reply card opposite page 34.

Complete Catalog and Reference Data on Valves and Fittings

311. The entire M & H line of valves, fittings and accessories for water works, irrigation, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Centrifugal and Turbine Type Pumps For Water and Sewage Plants

321. Turbine-type pumps, close or flexible couple drive, and end suction centrifugal pumps and mixed flow pumps are described in Catalog M available from Anzora Pump Div., The New York Air Brake Co., 636 Loucks St., Aurora, Ill. Included is a pump selection guide and spigot pipe. Check the reply card.

Manual on the Hersey Disc Water Meter

329. Illustrations, descriptions and specifications of Hersey water meters are covered in manual available from Hersey Mfg. Co., 250 Elm St., Dedham, Mass. Size ranges are 1/4"-14" x 1/4"-14" and 1". Check the reply card.

Tips for Installing Orangeburg Pipe

334. Good practice for installation of Orangeburg pipe and fittings is outlined in an illustrated four-page bulletin made available by the Orangeburg Mfg. Co., Inc., 375 Park Avenue, New York 22, N. Y. Trenching and backfilling, pipe laying, cutting and connecting with other types of pipe are included.

Book Tells

How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card.

Pneumatic Transmitters For the Water and Sewage Fields

350. Coordinated pneumatic rate of flow and loss of head transmitters, pneumatic rate of flow transmitters and pneumatic transmitters are covered in literature from Simplex Valve and Meter Co., Lancaster, Penna. Check the reply card for specifications.

How to Get Peak Water Production From Your Well

355. Well casings are a vital part of peak water production from wells as well as hiring a competent well driller. Catalog B-15-B from Thompson Pipe & Steel Co., 3025 Larimer St., Denver 1, Colo., covers in detail all types of well casings and their installations. Check the reply card.

Information on Boring Machines

365. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit are available in new bulletin just released by Earthworm Boring Machine, Inc., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included.

Modern, Welded Constructed Elevated Steel Tanks

382. Revised edition of Horton ellipsoidal elevated steel tanks of welded construction is available from Chicago Bridge & Iron Co., Advertising Dept., 332 South Michigan Ave., Chicago 4, Ill. The catalog is well illustrated and contains a table of standard tank dimensions for capacities ranging from 40,000 to 500,000 gals.

Trenchers for Water and Sewer Line Construction

384. Three Cleveland J trenchers incorporating major advances in trencher design and operating advantages are described in Bulletin 1-104 available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Check the reply card for digging capacities, specifications and dimensions.

Transite Pipe for Water Systems

447. The installation, operation and maintenance economies of Transite® pipe and the Ring-Tite® coupling for pressure water lines are described and illustrated in literature offered to engineers from Johns-Manville, 22 East 40th St., New York 16, N. Y. Check the reply card for tables of weights, sizes and pressure classes.

U. S. Tyton

Joint Pipe

490. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids has been announced. The newly developed Tyton Joint is simple, sturdy and tight. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co., Birmingham 2, Ala., or check the reply card.

V-Notch Chlorinator For Chlorine Flow Control

502. An 8-page catalog on the W & T Series A-721 chlorinator is available from Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Chlorinator is adaptable to any type of chlorinator control and feed rate may be controlled manually or automatically.

Diatomite Filters in Water Filtration

596. A new line of IWF diatomite filters is featured in this 10-page Bulletin 651 by the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. The IWF is ideal for medium and small town water supplies and the bulletin provides installation drawings, sectional views and operational sketches.

Turn Your Water Meter Reading Inside-Out

671. The Visi-Meter is a remote recording and indicator system that eliminates the need of entering the home to read water meters. It records within an accuracy of 0.1 percent. Check the reply card or write Visi-Meter, Inc., 301 North 17th St., Kansas City, Kans., for literature.

HAVE YOU REACHED YOUR *LIMIT*

ON CHEAP, FLIMSEY SIGNS?...



If you are tired of replacing your traffic-control signs year after year - then it's time to install long-life Miro-Flex signs. These quality signs are embossed on zinc-coated, Bonderized steel, and finished in high-grade, baked-on enamel. Embossing gives them greater strength, rigidity, and legibility than flat-surfaced signs. A complete line of uniform traffic-control signs, street-name assemblies, and custom-designed signs are available. Write for your free catalog and name of nearest source.

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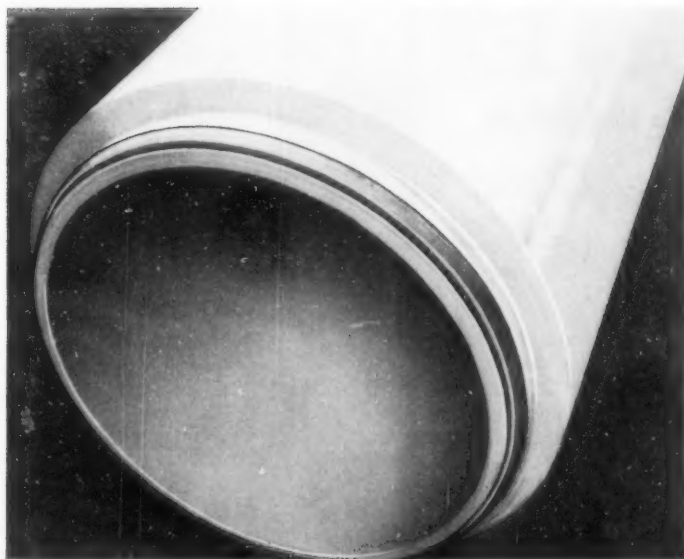
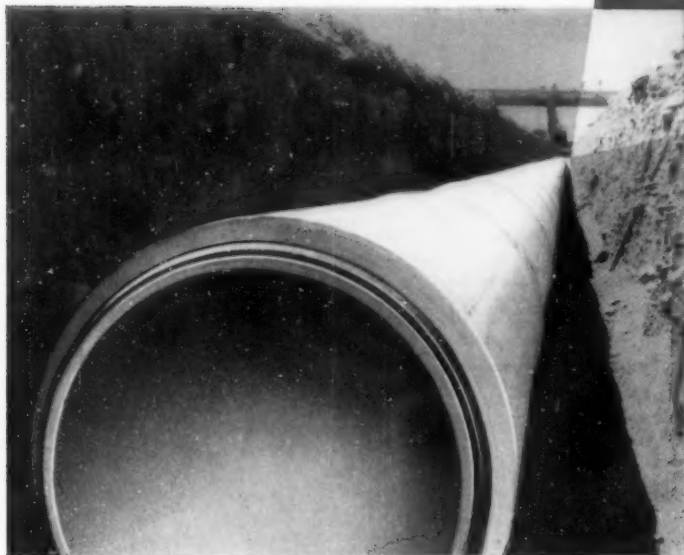
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Standard Traffic Signs Available for Immediate Delivery at Northeastern Warehouse

■ Keontz Equipment Corporation, 325 Ohio River Blvd., Emsworth, Pittsburgh 2, Pennsylvania ■

Along the
Coeur d'Alene
By-Pass...

PRESS-SEAL
makes 22,650 feet
of pipe watertight



In constructing the Interstate Highway No. 90 By-Pass at Coeur d'Alene, Idaho, 22,650 feet of culvert and sewer pipe were laid in sizes ranging from 10" to 48" in diameter.

Selection of Press-Seal confined compression type gaskets was made on two factors. Installation is fast and accurate because Press-Seal gaskets are easily and quickly fitted to the ends of the concrete pipe sections before they are laid. Their design and composition provide permanent protection against leakage in all types of soil. (As long as the pipes they seal.) Savings on installation time and cost are substantial.

Press-Seal gaskets are available in different types of material for every sewerage purpose: *Buna-N* for Oil Content Sewage, *Neoprene* for Acid Content Sewage, *Natural Rubber* for Common Sewage. Write today for detailed engineering data.

CONTRACTING AGENCY:

Department of Highways
State of Idaho
Mr. Jack Perring, District Highway Engineer, Coeur d'Alene, Idaho

CONTRACTOR:

Cherf Brothers, Inc. and Sandkay Contractors, Inc., Ephrata, Washington

PIPE SUPPLIER:

Spokane Concrete Pipe Company, Spokane, Washington

	10"	320 lin. ft.
TOTAL	12"	7,245 lin. ft.
	18"	2,660 lin. ft.
PIPE	24"	2,820 lin. ft.
	30"	5,550 lin. ft.
QUANTITIES	48"	4,055 lin. ft.



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PRESS-SEAL GASKET CORPORATION OF CANADA—KITCHENER, ONTARIO

To order these helpful booklets check the reply card opposite page 34.

AWWA Butterfly Valves Custom Built to Specifications

430. Butterfly valves that can be operated by air, oil, water, electrically or manually and are made in standard sizes to 24 ins. are fully described in literature from Fabri-Valve Co. of America, P. O. Box 4352, Portland 8, Ore.

Electronic Locators for Water Mains, Services, Valves and Boxes

477. Miniaturized line locator that is encased in a molded glass fibre container and has transistors that have a rated life of 70,000 hours and weighs only four lbs. when completely assembled is described in literature from Wilkinson Products Co., 3067 Chevy Chase Drive, Pasadena 3, Calif. Check the reply card.

Use The Reply Card

Bulletin Covers Step-by-Step Action on the Water Problem

497. A step-by-step outline of action telling how the responsible citizens can help their officials extend and improve the local water system through more adequate rate structures on financing is covered in this bulletin available from Theo. F. Wolfe, Managing Director, Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Illinois.

Water Filtration Costs Can Be Reduced

492. The "Celite" system of diatomite filtration makes possible reduced installation cost, with space requirements a fraction of those for equivalent sand filtration. For informative literature write Johns-Manville, Box 14, New York 16, N.Y.

Mueller Drilling, Tapping and Inserting Machine

496. The Mueller B-100 double pressure chamber tapping machine makes faster taps, assures pressure tight connections and can be used by hand or with power. Check the reply card or write Mueller Co., Decatur, Ill.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in bulletin S-55 of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Blower Selection Data Aids Sewage Plant Design

144. Characteristic curves for blower operation with constant-speed, multi-speed and variable speed motors; details of several types of blowers; data on accessories; and a discussion of advantages of positive displacement rotary blowers are provided in Bulletin RB 154 of Roats-Connersville Blower Div., Connersville, Ind.

Some Folks Want To Lift Digester Efficiency

57. If you are one, here's a new 8-page booklet containing details you will welcome. Just ask Walker Process Equipment Inc., Aurora, Ill., for their new Bulletin 25-S-91 on Walker "Gaslifters" or check the card.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the reply card or write to the manufacturer and ask for Bulletin TR-94A.

Specification Manual on the Hapman Tubular Conveyors

187. How to specify Hapman tubular conveyors for use with grit and filter cake including storage hopper, supporting structure and freeze-up protection are contents of this manual. For your copy check the reply card or write Stuart Corp., 516 North Charles St., Baltimore 1, Md.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

Dependable Engines for Sewage Treatment Plants

227. Climax Sewage Gas Engines are available for continuous duty operation to drive pumps, blowers or generators in a range of sizes from 40 to 250 HP. Use the handy reply card to obtain complete details and literature from Climax Division, Waukesha Motor Co., Box 379, Waukesha, Wisc.

DANLINE*

Sweeping Brushes

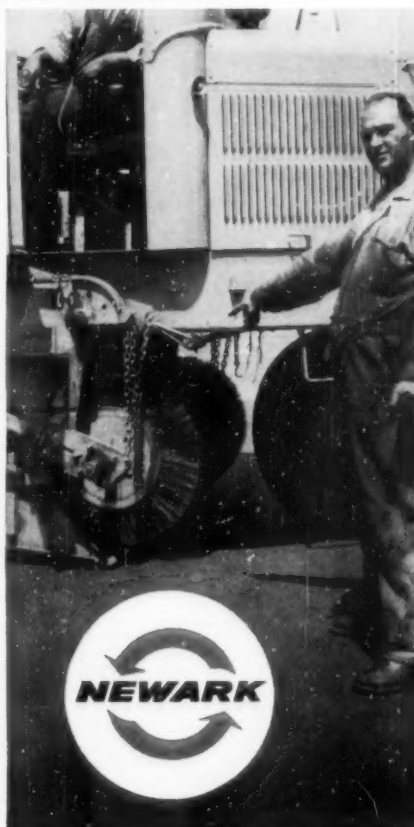
*Offer the Lowest Cost
Per inch of Wear!*

3000 sweeping miles or 500 sweeping hours . . . take your choice. Both figures are good, and you can get *both* with a Danline wire sweeping brush . . . Also, less than 10 cents per sweeping mile can be your cost! . . . In addition, there are extra savings in easier maintenance, less brush replacement and minimum storage space . . . Brush assemblies come in a compact package and require less than twenty minutes to put together . . . Danline brushes can remove heavy loads — up to 10" of sand in a single pass! . . . This is achieved through the use of round, small diameter brush wire which provides more sweeping ends per pound of fill material and a more uniform brush . . . We ask you to test the Danline — get the cleanest sweep you've ever had.

*U.S. Pat. 2864112

Newark Brush Company.

260 MICHIGAN AVENUE
KENILWORTH, NEW JERSEY



FLUIDICS* AT WORK

New Simplex telemeter reads and controls 2 to 29 channels

The new Orthoplex telemetering system uses a biplex generator and biplex selector to achieve dual signal telemetering using a single pair of telephone lines.

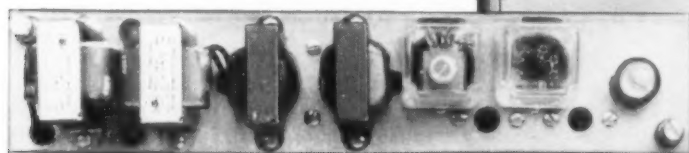
In the basic system the generator produces both a dc and a 60-cycle ac signal which is unscrambled at the receiving end by the selector. These 2 signals are fed into a multiplexing unit which provides the extra channels.

Uses ac and dc signals—Combining ac and dc currents produces a circuit less affected by line capacitance and able to give a longer distance transmission with available capacitance.

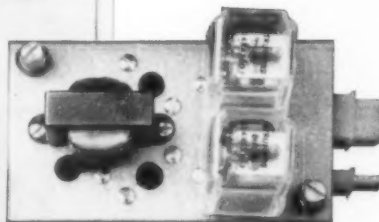
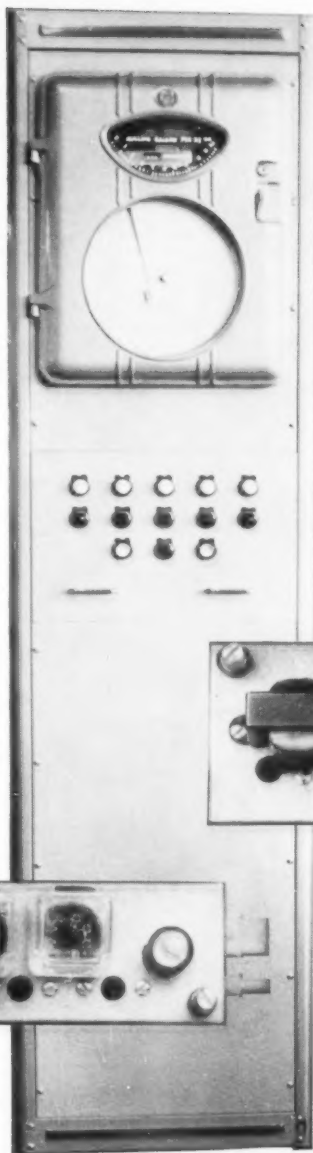
The new system requires much less maintenance than previous designs. It uses no vacuum tubes, eliminates all motorized timers and motorized sequence switches; and the modular units are equipped with "quick-disconnect" connectors, plug-in relays, and rectifiers of advanced design.

Modular design—The modular design allows building up as many as 29 separate channels for supervisory indicators, alarms, telemeter receivers, pump controls, valve positioners, etc.

For complete specifications and design theory, write for bulletin to our Simplex Division, Dept. PW-129, Lancaster, Pa.



BIPLEX Generator is designed to give two signals, a positive dc and 60-cycle ac.



BIPLEX Selector separates signals so they operate relays sensitive only to their assigned signal.

*FLUIDICS is a new Pfaudler Permutit program which provides a modern, imaginative approach for handling and processing liquids and gases more profitably.

SIMPLEX Orthoplex Supervisory Control provides you with a system for remote control of valves and pumps from a central station.

SIMPLEX

a division of PFAUDLER PERMUTIT INC.
Lancaster, Pennsylvania

Specialists in FLUIDICS...
the science of fluid processes

To order these helpful booklets check the reply card opposite page 34.

Foxboro Magnetic Flow Meter

234. The Foxboro magnetic flow meter measures water and wastes electrically, without any line restriction. No loss of head, no fouling, even with slurries. For detailed illustrated Bulletin 20-14B check the reply card or write The Foxboro Co., Foxboro, Mass.

Turnkey Sewage Treatment Plant

239. Plants for smaller population areas that are furnished and installed on a turnkey basis are covered in literature from Municipal Service Company, 4625 Roanoke Parkway, Kansas city 12, Missouri. Check the reply card for your key to low cost sewage treatment.

Dorr-Oliver CompeTreator For Small Sewage Plants

264. An 8-page, 2-color bulletin that describes the Dorr-Oliver CompeTreator is available from Dorr-Oliver, Inc., Stamford, Conn. Check the reply card for line drawings, flow diagrams and a series of photographs showing the step-by-step installation of the unit.

A New and Better Method of Burning Refuse

296. Advantages of incineration, industrial application, firing methods, design and performance of the C-E incinerator stoker are explained in literature. Check the reply card or write Combustion Engineering, Inc., Combustion Engineering Building, 200 Madison Ave., New York, N. Y.

Separation of Suspended Solids in Water and Sewage Treatment

512. A 24-page bulletin covering the complete line of clarifier and Oxidator® mechanisms is available from Process Engineers, Div. of The Eimco Corp., 634 South Fourth West St., Salt Lake City, Utah. Check the reply card for the basic types that cover a full range of tank sizes and load requirements, and special units for unusual conditions.

Data on Adjustable-Speed Magnetic Drives for Low-Lift Pumps

443. A catalog is available from Electric Machinery Mfg. Co., Minneapolis 13, Minn. that tells all about E-M Vertical Synchronous Motors and Magnetic Drive Units. Engineers check the reply card for information on this equipment for sewage pumps.

Torque-Flow Sewage Pump For All Phases of Sewage Treatment

496. Bulletin No. P10-B26 describes the operation of the Wemco torque-flow sewage pump and covers typical installation set-ups. Check the reply card or write Western Machinery Co., 650 Fifth St., San Francisco, Calif., for complete details.

Data and Specifications on Aluminum Grating Walkways

531. Aluminum walkways for bridges, sewage and water treatment plants and garages are covered in bulletins available from Washington Aluminum Co., Inc., Knecht Ave. & Pennsylvania R. R., Baltimore 29, Md.

Standardized Motor Control Centers

501. The Unitrol is designed to meet your specific control requirements by providing full open phase protection with 3-coil overload relays and other features. Check the reply card or write Cutler-Hammer, Inc., Milwaukee 2, Wis.

Controls For Use in Pumping Stations and Sewage Plants

662. Single and multi-pump sump controls, pressure operated for use in pumping stations and sewage disposal plants are described in literature available from Healy-Ruff Co., Water Level Controls Div., 2255 University Ave., St. Paul 14, Minn. The two principal types of pressure operated sump controls are covered along with general descriptions and features.

Plastic Pipe For Liquids and Gases

514. Kraloy rigid polyvinyl chloride plastic pipe can be used for liquids and gases and will not rust, rot or corrode. Write to Kraloy Plastic Pipe Co., 4720 E. Washington Blvd., Los Angeles, Calif., or check the reply card for complete details on this lightweight pipe.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135A describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14, Ill.

Press-Seal Rubber Gaskets to Seal Joints of Concrete Pipe Sewers

623. Rubber gaskets for sealing the joints of concrete sewer pipe are described fully in literature available from Press-Seal Corp., P. O. Box 482, Fort Wayne, Ind. Check the reply card for information on how these gaskets prevent water infiltration in sewer lines.

Application and Design of Prefabricated Pumping Stations

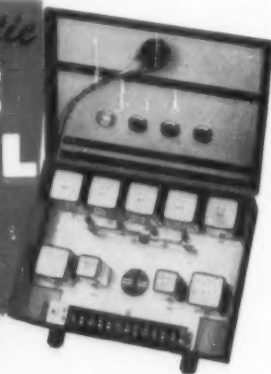
637. This manual is intended for a guide in designing sewage pumping stations and in explaining the use of prefabricated underground sewage pumping stations. Check the reply card or write to Zimmer & Francescon, 1715 Fifteenth Street Place, Moline, Ill., for your copy.

Full Line of Sewer Cleaning Equipment

681. Everything for rodding sewers from hand operated equipment to the fully mechanized SewerRocker. Tools for all types of stoppages are operated by Flexicrome Steel Sewer Rods. Featuring the Truck-Loder which dumps sewer deposits directly into truck, a complete range of Bucket Machines is offered. All equipment is described in 48-page Catalog 55-A. Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif.

Full Automatic ENGINE CONTROL SETS

for Start, Stop, and Protection of Engines



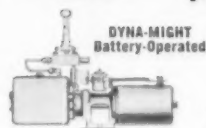
Synchro-Start's new protective engine controls have been designed, for the starting and stopping of engines from remote pilot devices, such as pressure switches, float switches, power failure relays, etc., and are completely automatic in operation. These dependable controls are encased in a steel, dust proof cabinet, and now feature enclosed PLUG-IN RELAYS as well as OVERLOAD BREAKERS. The plug-in relays simplify what little field maintenance that may have been required in older models, while the overload breakers eliminate the necessity of replacing fuses. In designing this unit we have used the same high quality materials and workmanship that our customers have come to expect throughout Synchro-Start's 27 years of manufacturing engine controls.

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVE. • BROOK, ILLINOIS

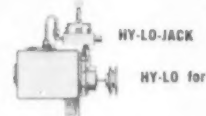
LIFT-LOWER SNOW PLOWS IN SECONDS



POWER HYDRAULIC CONTROLS



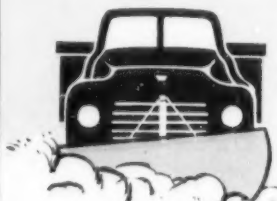
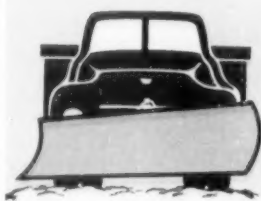
DYNA-MIGHT
Battery-Operated



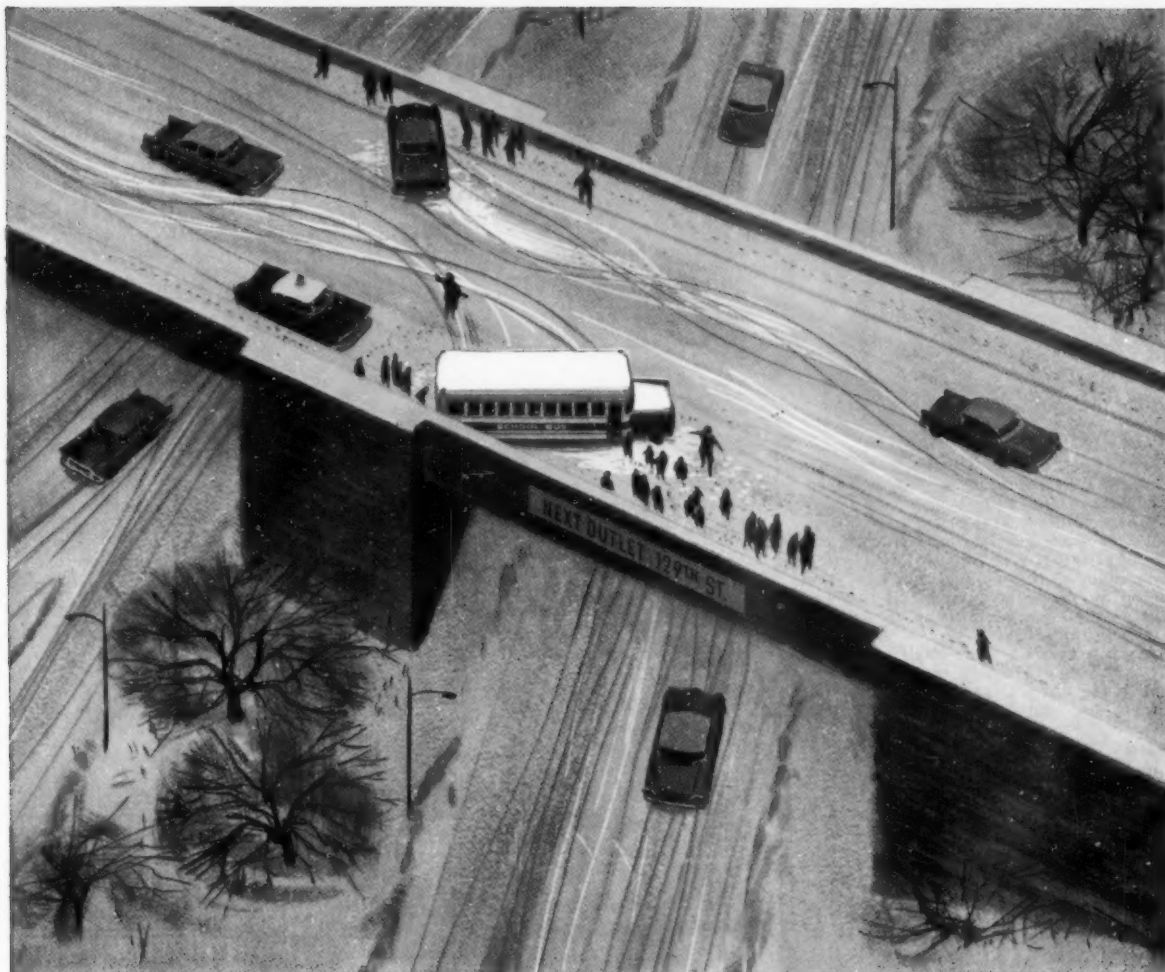
HY-LO-JACK

HY-LO for Jeep Fan-Belt Driven

One man controls the plow from the cab . . . instant up-and-down action with the flick of a wrist. Snow removal is easier, faster, more economical with Monarch. See your dealer or write for illustrated folder.



MONARCH ROAD MACHINERY COMPANY
1331 Michigan St., N. E. — Grand Rapids 3, Michigan



Protect against accidents like this!

*Use straight Morton Rock Salt—the most effective way to help
keep streets, freeways and tollroads safer in winter*

Straight Morton Rock Salt does the job abrasives and Salt mixed with abrasives can't do to help prevent accidents caused by ice and snow. Morton Rock Salt gives *abrasive traction* against skidding even before the salt starts to melt the ice. Rock Salt crystals are larger than other commonly used ice melting chemicals and *penetrate ice deeper* with a corkscrew action—not just melt surface ice. Due to Rock Salt's better penetration, it reaches the pavement fast and quickly *melts* the bond between ice and the street surface.

Morton Rock Salt is safe, clean, economical

Straight Morton Rock Salt is non-toxic. It does not damage animals' paws, rubber, fabrics, leather, asphalt, brick or properly seasoned concrete. It will not clog sewers or leave a rutted, dirty pavement as will sand or cinders. What's more, Rock Salt melts *more ice at lower cost* at any temperature above 8° F. than any other commonly used ice melting chemical.

Send for more information today!

- ☐ Please send me your free book on ice and snow removal.
☐ I would like a Morton representative to advise me on how best to stockpile Morton Rock Salt.

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Title

Address

City Zone State

MORTON SALT COMPANY

INDUSTRIAL DIVISION

Dept. PW-12, 110 No. Wacker Drive, Chicago 6, Illinois



To order these helpful booklets check the reply card opposite page 34.

Street Sweepers' CAN CARRIERS



TARCO "Street Sweepers' Friend" Can Carriers are the toughest, best balanced, easiest pushing carts you can buy.

All welded steel construction . . . no bolts, no rivets, no dangling chains. Choice of big, easy-to-push wheels with either pneumatic, solid rubber or plain steel tiring on roller bearings. Full swiveling caster wheel. Silent can-clamp. Tool hooks. Traffic warning flag.

Make it easy on yourself all way round . . . buy longer lasting can carriers that look good; that will be less tiring for your men to push and use. Buy TARCO "Street Sweepers' Friend" Can Carriers. See your nearest TARCO dealer or write for details.

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WELL —

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60 YEARS!

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**WATER
PURIFICATION
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MECHANICAL EQUIPMENT
BY
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STREETS AND HIGHWAYS

How to Prepare and Maintain Roadways With Calcium Chloride

45. "The Calcium Chloride Road," is the name of a new 24-page two-color catalog issued by the Columbia-Southern Chemical Corp., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa. Included are sections on dust control, gradation, placing and mixing materials and shaping. General information on spring, summer and fall maintenance is also provided. Check the handy reply card.

Useful Attachments for "Payloador" Tractor Shovels

95. Increased versatility for Hough "Payloador" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc.

Modern Compaction Methods and Equipment

200. This 52-page Manual covers modern day compaction methods and equipment, rubber-tire rolling, compaction of asphalt mixes, aspects of vibratory compaction, stage compaction on cohesive soils and compaction of asphaltic concrete surfaces. Check the reply card or write Road Machinery Div., Bros Inc., 1057 Tenth Ave., S. E., Minneapolis 14, Minn., for your copy.

Portable Hot Asphalt Paving Repair Unit

250. Maximum economy in paving repair and maintenance is claimed for the compact "Patchmobile" which has a rotary tube continuous dryer, batching hopper for accurate proportioning, twin hot asphalt tanks, heat jacketed pugmill, tool heaters and hand spray bar. Get latest data from Wylie Mfg. Co., 5926 N. W. 39th St., Oklahoma City 12, Okla. Use the reply card.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem, reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass.

Dotmar Pavers for Integral Gutters, Curbs and Sidewalks

284. Dotmar self propelled curb and gutter paver is described in literature from Dotmar Industries Inc., 502 Hanselman Bldg., Kalamazoo, Mich. Check the reply card for full specifications.

Manual on the Use of Calcium Chloride

301. This manual presents the physical and chemical properties of the new pellet-type calcium chloride and its water solutions. Also, gives complete data on shipment, handling and storage. Check the reply card or write The Dow Chemical Co., Midland, Mich., for your copy.

From a Stump to Chips in Minutes

303. Pow-R-Stump cutter is operated by one man, handles stumps of any width and up to 33 ins. in height and will not damage curbs, driveways or sidewalks. For literature check the reply card or write Vermeer Mfg. Co., Pella, Ia.

New Methods and Materials For Mounting Sweeper Brooms

393. Simplified core filling with long lasting plastic filaments is described in fact sheet. Write Rynal Corporation, 114 St. Joseph St., Arcadia, Calif., or check the reply card.

How To Build Stabilized Heavy Traffic Pavements

300. A 16-page booklet published by Seaman-Andwall Corp., 13050 West Blue Mound Rd., Elm Grove, Wisc. shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worthwhile booklet for every highway engineer.

Manual on Steel and Wire for Road Building

337. Design data on wire fabric for concrete pavements, joint data, guardrail design standards, steel and wire for concrete pipe and reinforced bituminous concrete design are some of the sections covered. Check the reply card or write American Steel & Wire Div. of United States Steel Corp., Cleveland 13, Ohio, for this valuable manual.

Light Duty Trucks For Construction and Maintenance

628. Pickup and stake body trucks are fully described in literature from Ford Div., of Ford Motor Co., Dearborn, Mich. Pickups are available in 6½, 8 and 9-ft. lengths. They come in standard colors and with either a 6 or V-8 engine. Rigid tailgate and steel corner posts add to the over-all body strength. The stake body trucks come in 6½, 7½ and 9-ft. lengths. These units also come in 6 or V-8 engines. Check the reply card for full information.

Selection of a Small Packaged Air Compressor

431. Catalog 1548 contains tabular and chart information on cu. ft. of air required to operate a variety of pneumatic equipment, average and continuous air supply tables and charts on ratios of compression and tables on flow of air through orifices. Check the reply card or write Ingersoll-Rand Co., News Service Dept., Phillipsburg, N. J.

Ultra-Clean Sweeping For Streets, Yards and Airports

499. A new approach to extra-clean sweeping is described in a 4-page illustrated Bulletin (No. 833) issued by the G. H. Tennant Co., 755 N. Lilac Drive, Minneapolis 22, Minn. Described is a 7¼" path sweeper that eliminates the use of water for dust control. Check the reply card.

For Prompt Service Use The Reply Card

Complete Line of Road Rollers and Compaction Equipment

520. Buffalo-Springfield's complete line of road rollers and compaction equipment is described in a 12-page illustrated Bulletin No. S-73-157 just released by Buffalo-Springfield Roller Co., Division of Koehring Co., Springfield, Ohio. Check the reply card for on-the-job pictures, as well as construction details of the 2-axle tandems, 3-axle tandem, 3-wheel rollers and the K-45 Kompactor.

Pre-Assembled Dowel Units For Highway and Airport Construction

537. Laclede dowel assemblies for expansion, contraction and construction joints are precision welded into one unit and are maintained in rigid alignment. For full details write Laclede Steel Co., St. Louis, Mo., or check the reply card today.

Vacuum Cleaner and Leaf Collector For Cleaner Streets

595. A unit is now available that can be mounted on a right-hand drive jeep or a pick-up truck for picking up gutter trash and leaves. Complete specifications, capacity, operation and installation procedures are covered in a bulletin available from Tarrant Mfg. Co., Saratoga Springs, N. Y.

Sweeping Brushes for Road and Sanitation Departments

648. Danline brushes made of round brush wire are easily assembled and require a minimum amount of repair and maintenance. Check the reply card or write Newark Brush Co., 260 Michigan Ave., Kenilworth, N. J., for full details.



First step—spot the post hole digger and let the dirt fly. Stress-Spun standards, with butt foundation, eliminate the need for costly, troublesome cast-in-field foundations.



Next, pick up the Hy-Lite pole with a rope sling and set in the hole. Any pole line truck or crane will handle the job with ease. Then align the pole in a vertical position.



Finally, backfill around the butt foundation with fine crushed stone. Wet, then tamp. Total setting time—14 minutes...ready for all electrical work.

SET IN LESS THAN 15 MINUTES



Finished Hy-Lite installation—attractive appearance and daylight safety around the clock.

The easy, low cost DRILL, SET, TAMP method of installation helps make Hy-Lites your best lighting pole buy.

Take time to request Catalog No. 400. It will give you details on the wide range of attractive Hy-Lite designs and the many plus advantages of prestressed concrete standards. Address the American Concrete Corporation, 5092 North Kimberly Avenue, Chicago 30, Illinois.

American Concrete
STRESS-SPUN
HY-LITE
LIGHTING STANDARDS

To order these helpful booklets check the reply card opposite page 34.

STREET LIGHTING AND TRAFFIC CONTROL

Damaged Barricades Can Be Repaired With PM Barricade Kits

163. PM barricade kits provide a flexible replacement system for damaged barricades. Check the reply card or write Pacific Mercury, 13232 Leadwell, No. Hollywood 9, Calif., for details on PM transistor neon or incandescent flasher warning lights.

Complete Catalog on Traffic Control Equipment

240. All types of controllers, PR system of coordinated traffic control, vehicle detectors, timers, vehicle counters and radar speed meters are covered in catalog available from Automatic Signal Div., Eastern Industries Inc., Norwalk, Conn. Check the reply card.

Investigate These Street Lighting Standards

34. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy reply card. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works Company, 1033 Herman St., Nashville, Tenn.

Street Lighting Poles for Streets and Highways

443. Standard designs, assembly details, suggested pole sizes, base construction details and bracket arm details are some of the details covered in this 22-page catalog. Check the reply card or write The Union Metal Mfg. Co., Canton, Ohio, for Catalog No. 78-A on street lighting poles of modern designs for all streets and highways.

Tomorrow's Lighting on Today's Streets

79. Bulletin GEA-6989, 12 pages, illustrates how several cities, both large and small, met the challenge of poorly lighted downtown areas. Check the reply card or write General Electric Co., Schenectady 5, N. Y., for data on mercury, fluorescents and filament lighting luminaires.

Plywood Signs For Expressway Signing

149. Crezon overlaid plywood signs will withstand the worst weather and will not check, split or bend or tear loose from the pole. Check the reply card or write Crown Zellerbach, San Francisco 19, Calif., for complete data on this signing material.

Non-Electric Traffic Control Products

154. Reflective pavement marking glass beads, Cataflex "202" reflective coating, Cataline reflective striping, Cathatherm reflective plastic striping, plain and reflective street and highway signs, plain and reflective street name signs are covered in literature from Cataphot Corp., P. O. Box 2066, Jackson, Miss.

Highway Lighting Engineering Guide

207. This catalog is primarily aimed at the new highway lighting program that is being undertaken nationally. It gives data on the quantity of light required; lighting on main traffic lanes, interchanges, intersections, toll plazas and bridges. It also covers information on the relative cost of lighting and the selecting of the light source. Write to Westinghouse Electric Corp., Lighting Div., 1216 West 58th St., P. O. Drawer 5817, Cleveland, Ohio.

Use The Reply Card

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "E-On" traffic sign faces ready for immediate shipment. Reflectorized faces cost about one half as much as new signs and are easily attached to existing traffic signs. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Lighting Standards for Every Outdoor Lighting Requirement

284. Complete design details, typical installation photos and how Hy-Lite standards are made are covered in this valuable guide. Check the reply card or write to the American Concrete Corp., 5092 North Kimberly Ave., Chicago 30, Ill., for Catalog 400.

3M Letters for Large Reflectorized Signs

374. "3M Signal" letters are made with "Sechlite" reflective sheeting encapsulated in acrylic plastic and are used on large reflectorized signs. Check the reply card or write Minnesota Mining and Mfg. Co., St. Paul 6, Minn., for full details.

Manual on All Types of Traffic Signs

379. This 26-page manual covers regulatory, warning, school, railroad, street name, road construction, route markers, miscellaneous signs and plastic reflectors. Check the reply card or write The Miro-Flex Co., Inc., 1824 East Second St., Wichita 7, Kans.

Case History of a Major Street Lighting Improvement

562. A joint project between the city and the utility on a street lighting improvement is covered in literature from Pfaff & Kendall, 84 Foundry St., Newark 5, N. J. Check the reply card for data on how this job was done.

Aluminum for Complete Line of Signs and Sign Blanks

673. Valuable information on aluminum's advantages, features and economics, plus details on application of all sign message materials are covered in the aluminum sign bulletin from Kaiser Aluminum & Chemical Sales, Inc., Dept. MU-936, 919 N. Michigan Ave., Chicago 11, Ill. Check the reply card today.

**ALGAE-FREE WATER
MEANS**

*Copper Sulfate
treated water*

Not only is Triangle Brand Copper Sulfate successful in controlling algae but it also is effective in killing some aquatic weeds. Since the weeds are submerged and disintegrated, there is no chance of them floating down stream to start new infestations, or to clog the waterway.

In sewage systems, Triangle Brand Copper Sulfate prevents roots and fungus from clogging pipes. However, there is no danger of affecting the surface trees owing to the low concentration of copper sulfate necessary to be valuable.

The new booklets "The Use of Copper Sulfate in The Control of Microscopic Organisms" and "Copper Sulfate for Root and Fungus Control in Sanitary Sewers and Storm Drains" will keep you up to date. Send for a copy today! Phelps Dodge Refining Corp., 300 Park Ave., New York 22, N. Y.

PHELPS DODGE REFINING CORP.

POWERS *American*

"Pole-Master"

PRESENTS THE SERIES PM-30

OSCILLATING HYDRAULIC DERRICK

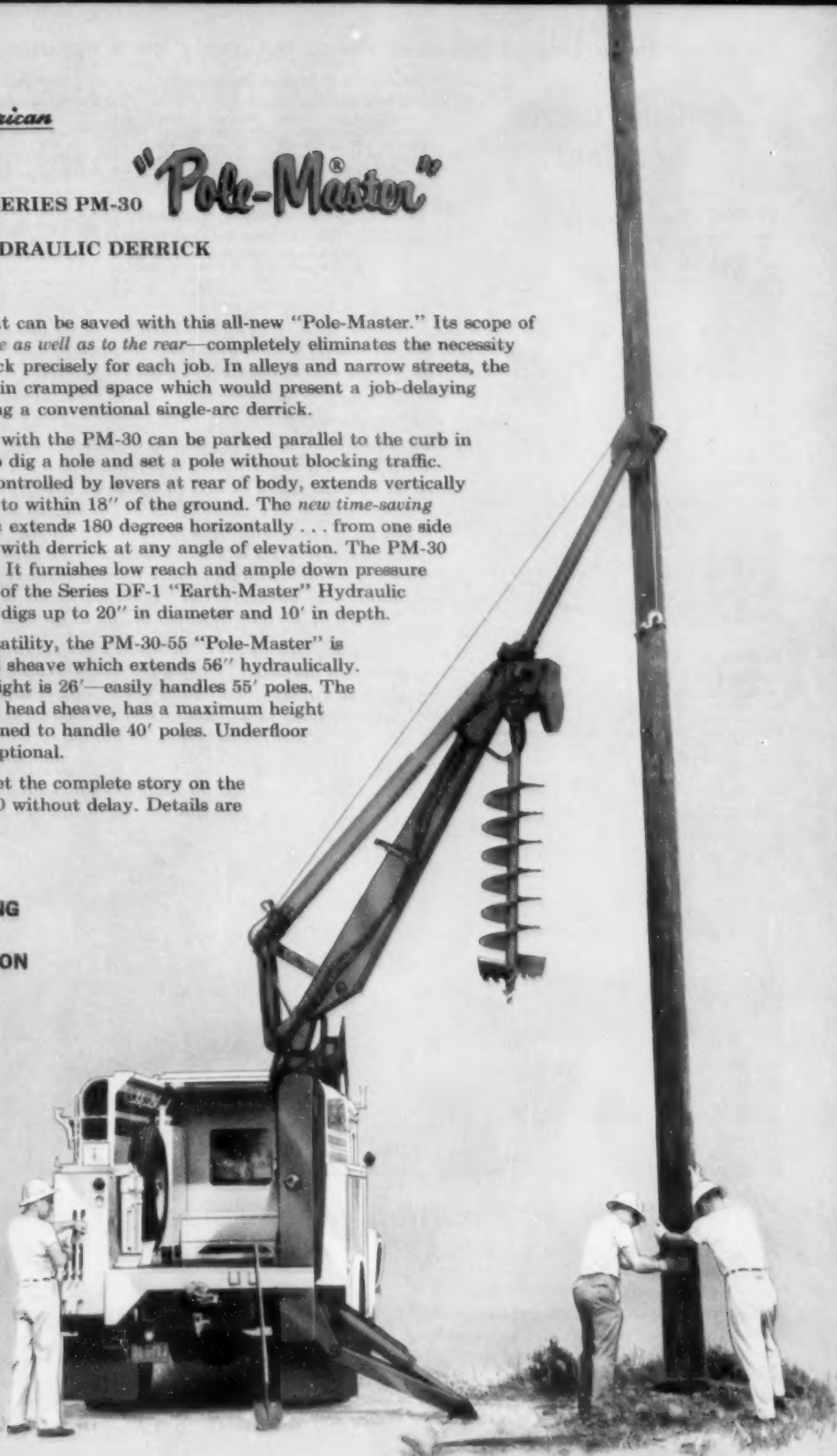
Think of the time that can be saved with this all-new "Pole-Master." Its scope of operation—to each side as well as to the rear—completely eliminates the necessity of positioning the truck precisely for each job. In alleys and narrow streets, the PM-30 handles work in cramped space which would present a job-delaying problem to crews using a conventional single-arc derrick.

Line trucks equipped with the PM-30 can be parked parallel to the curb in congested areas . . . to dig a hole and set a pole without blocking traffic. Derrick movement, controlled by levers at rear of body, extends vertically from stowed position to within 18" of the ground. The *new time-saving dimension of operation* extends 180 degrees horizontally . . . from one side of body to the other, with derrick at any angle of elevation. The PM-30 body-loads with ease. It furnishes low reach and ample down pressure for most efficient use of the Series DF-1 "Earth-Master" Hydraulic Digger shown, which digs up to 20" in diameter and 10' in depth.

For even greater versatility, the PM-30-55 "Pole-Master" is equipped with a head sheave which extends 56" hydraulically. Maximum derrick height is 26'—easily handles 55' poles. The PM-30-40, with fixed head sheave, has a maximum height of 21' 6" and is designed to handle 40' poles. Underfloor winch line travel is optional.

Make it a point to get the complete story on the work-speeding PM-30 without delay. Details are yours for the asking.

A NEW TIME-SAVING DIMENSION IN DERRICK OPERATION



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625 CEDAR STREET
BERKELEY 10, CALIF.

5525 S. E. 25TH AVE.
PORTLAND 2, ORE.

To order these helpful booklets check the reply card opposite page 34.

CONSTRUCTION EQUIPMENT AND MATERIALS

Catalogs on Steel Piling

66. Two catalogs, one describing sheet steel piling for cofferdams and retaining walls, the other describing H-piles for bridge and building foundations are available from Bethlehem Steel Co., Bethlehem, Pa. Check the reply card.

Four Wheel Drive 1 1/4 yd. Front End Loader

115. The Trojan 1 1/4 yd. loader for heavy-duty bulk materials handling is covered in bulletin available from Contractors Machinery Div., The Yale & Towne Mfg. Co., Batavia, N. Y. Check the reply card.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your buildings needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Write to Butler Mfg. Co., Kansas City, Mo.

Catalog on Utility Bodies and Equipment

260. General service bodies, line construction bodies, aerial equipment, winch and derrick equipment and trailers are the units covered in this catalog. For design, dimensions, illustrations and descriptions check the reply card or write McCabe-Powers Auto Body Co., 5900 N. Broadway, St. Louis 13, Mo.

International Wagner Heavy-Duty Loaders and Backhoes

195. International Wagner loaders and backhoes are matched with International utility tractors and are described in Catalog CR-1076-1 available from International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago 1, Ill. Check the reply card.

Reference Bulletin Showing Treatment and Correction for Masonry Construction

357. Maintenance problems of masonry construction are covered in this 20-page bulletin from Standard Dry Wall Products Inc., New Eagle, Pa. Check the reply card for this complete and concise bulletin.

Use The Reply Card

Tractors and Equipment for Municipal Use

407. Specification sheets for the John Deere crawler and utility wheel tractors; also equipment for loading, dozing, mowing, sweeping and many other operations. John Deere, Industrial Division, Moline, Ill. Check the reply card. State type of tractor and equipment.

1960 Truck Line Story From Chevrolet

446. The 1960 Chevrolet truck line is described fully in literature from Chevrolet Motor Division, General Motors Corp., General Motors Building, Detroit 2, Michigan. Check the reply card for data on this line of 165 models.

Literature on Concrete

Gunning Equipment

482. The placing of gunned concrete and the equipment used in this operation are described in literature from Air Placement Equipment Co., 1009 West 24th St., Kansas City 8, Mo. Check the reply card.

One Man Operated—Fully Hydraulic Truck Crane

459. Boom length which is hydraulically controlled extends to 13 ft. and can lift up to 6,000 lbs. Check the reply card or write Stanco Mfg. & Sales Inc., 1666 Ninth St., Santa Monica, Calif., for complete data.

Drott TD-15 "4-in-1" Skid-Shovel

504. Features of the Drott skid-shovel are graphically depicted in 16-page, two-color catalog available from International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago 1, Ill. Check the reply card for complete descriptions.

Choosing the Right Size Tractor for the Job

655. An 8-page Bulletin D837 that explains how matched tools boost production by adjusting each tractor to the specific job is available from the Advertising Div., Caterpillar Tractor Co., Peoria, Ill. Also the methods for selecting used equipment are discussed. Check the reply card.

Construction Guide For Engineers and Builders

669. A 34-page four sectioned construction guide containing full-page structural drawings that provide basic information on types, grades and applications of fir plywood for engineers and builders has been released by Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card for data on floor construction, single and double wall construction and roof construction.

Slide Rule P51 Calculator For Concrete

713. A new pocket size slide rule calculator for the testing of concrete in compression is available from Forney's Inc., P.O. Box 310, New Castle, Pa. It is designed to convert instantly the pressure applied to concrete cylinders and blocks into psi.



*THE NAME ORANGEBURG AND THE SILVER BAND ARE REGISTERED TRADE-MARKS OF THE ORANGEBURG MANUFACTURING CO.

Over 300 million feet in use coast to coast!

The test of time has proved the high quality of Orangeburg Root-Proof Pipe and Fittings for house sewer lines, downspout run-offs and other underground, non-pressure uses.

Orangeburg's Taperweld Joints seal root-proof and watertight. No leakage, no infiltration. And because it's made of a strong, tough non-metallic material, Orangeburg does not rust. Alternate freezing and thawing... acids and alkalis found in ground water and sewage do not affect it.

All these qualities plus speed, ease and economy of installation have

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The Silver Band* identifies genuine Orangeburg; Root-Proof Pipe for sewer lines; Perforated Pipe for foundation drains, septic tank disposal fields. Orangeburg exceeds requirements Federal Spec. SS-P-356 and Commercial Standard CS 116-54. Write Dept. PW-129 for Engineer's independent report.



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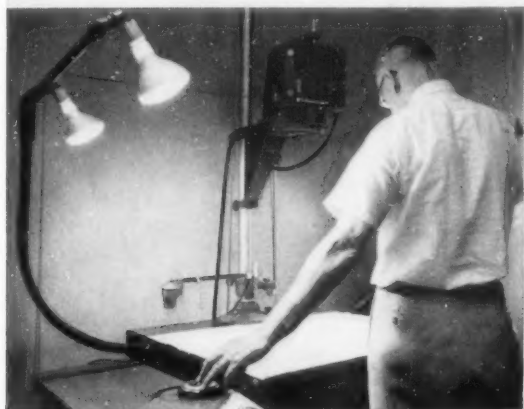
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See how Recordak Precision Engineering Drawing System speeds engineering and drafting routines for Cook County, Illinois, Highway Dept., now engaged in a multi-million-dollar highway expansion program.



Mr. F. A. Cerwin, Record Administrator, looks over Recordak Microfilm file, now the *active* drawing file for Cook County Highway Department



FIRST STEP for Cook County was to put its tens of thousands of drawings on 35mm Recordak Microfilm, using techniques and quality-control methods developed by Recordak through years of research. The resulting negatives are needle-sharp images with remarkably uniform backgrounds. Mounting each frame in its own Filmsort aperture card completes job.

RESULTS: New "microfilm" drawing file takes 95% less space. Makes reference in film reader a snap. Ends need for costly reference blueprints that clog up the files! Reduced-size paperprints, when needed, are made in minutes for only pennies apiece. Another advantage: a positive film copy of master negatives provides a security copy at negligible cost.

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To order these helpful booklets check the reply card opposite page 34.

SNOW AND ICE CONTROL

Snow Plows For Every Need

294. Frink snow plows are designed to meet snow removal needs at airports, parking lots and streets and highways. They consist of four basic types with models to fit trucks 1½ to 12 tons. For complete data write Frink Snow Plows, Inc., Clayton, N. Y.

Rock Salt For Ice and Snow Removal

534. Application rates and procedures of using Morton rock salt for ice and snow control are covered in catalog from Morton Salt Co., 110 No. Wacker Drive, Chicago 6, Ill. Check the reply card for Catalog F-35.

Ice Control Without Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.

Use The Reply Card

How to Make Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and directions for its use has been made available by Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

REFUSE COLLECTION AND DISPOSAL

Where Does It Go From Here?

63. That is the title of new 12-page booklet, D 930, with thorough discussion of garbage disposal by sanitary landfill method. Read the latest report from the experts. Caterpillar Tractor Co., Peoria, Ill., or check card.

Reduce Your Refuse Disposal Costs

150. A complete line of refuse disposal systems that include containers, giant containers, compaction bodies and compaction trailers are described in literature from Dempster Brothers, Dept. PW, Knoxville 17, Tenn. Check the reply card for data on these efficient systems.

General Specifications for Refuse and Garbage Trailers

251. Two bulletins, one on the Pak-Mor 38 cu. yd. tandem axle trailer unit and the other on the Pak-Mor 32 cu. yd. trailer for use with Model GRD Dempster are available from Pak-Mor Manufacturing Co., Box 6147, San Antonio, Texas. General specifications, power train, operating procedures, maintenance and lubrication and other helpful information are included.

Data on the Hydro E-Z Pack Disposal Body

572. This disposal body has no moving chains, no whirling knives, and has a 76,600 lb. pressure that takes anything and compacts everything. Check the reply card or write Hydro E-Z Pack, Div. of Hercules Galion Products, Inc., Galion, Ohio, for a copy of Bulletin E-100.

BUSINESS ADMINISTRATION

Save Space By Filming Your Records

57. Microfilm your records by using the Recordak Microfilmer. Check the reply card or write Recordak Corp., 415 Madison Ave., New York 17, N. Y., for operation, use and price of this machine. Also available is literature on the Recordak Verifax Copier that makes certified copies 15 times faster than typing.

If You are Considering a Bond Issue Check with Chase Manhattan

236. For details on bond issues for any municipal or governmental unit, write The Chase Manhattan Bank, 40 Wall St., New York 15, N. Y. Check the reply card.

How Good Are Your Truck Drivers? The Tachograph Will Tell You

682. Accurate records of truck engine operation are made available by the Tachograph. Find out how savings and safety can be promoted by getting Bulletin SU-3 from Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo. Details of construction and descriptions of operation are included.

WEED AND DUST CONTROL

How to Cut Weed Control Costs

308. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.



TENNANT MODEL 100 is available with cab, power steering, flashing lights, rotating beacon, etc.

Now... a new way to sweep up ALL the dirt

You've never seen such clean sweeping as you'll get with the TENNANT Model 100 Vacuumized Sweeper.

Powerful pickup. Cleaning a 7'4" path, this remarkable new sweeper gets virtually all the dirt. Particles fine as 5 microns (far smaller than human eye can see) are caught by the huge 540 sq. ft. filter.

No dust, no water. Since the Model 100's powerful brush-and-vacuum system captures the dust, there's no need for water spray... there-

fore no unsightly mud streaks, no winter freeze-up problem.

Many uses. Short (10'2") turning radius and ultra-clean sweeping makes the TENNANT 100 ideal for downtown areas, alleys, parking lots, tunnels, bridges, air terminals, better residential areas... wherever you want really clean sweeping!

WRITE TODAY for complete specifications and performance data. G. H. Tennant Company, 775P N. Lilac Drive, Minneapolis 22, Minnesota.



VACUUMIZED SWEEPERS

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Your taxpayers have entrusted you with a decision—long-range in nature and far-reaching in consequences—to purchase pipe for your community's water system addition. Whether you borrow money or use current funds, you can't afford to take a chance on pipe that is unproven, with many failures in less than 20 years.

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If you want more proof, we can supply it. Sixty-eight cities are still using Cast Iron Pipe more than 100 years old. Join the Century Club! Safeguard your city's welfare with the only pipe that has stood the test of time.

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TL-14 with FULL POWER-SHIFT TRANSMISSION

Exclusive single-lever speed and direction control!

You get more than just a full power-shift transmission with the TL-14 TRACTO-LOADER. You get a transmission that is controlled by ONE LEVER — not two or more levers or a combination of levers and foot pedals.

This means no stopping to shift to get into a higher gear. You go into and out of any forward or reverse gear "on-the-go"—from low to second or high instantly, while moving.

And you get a power-shift transmission

that is equipped with a torque converter with a big 3.5-to-1 ratio of torque increase at full stall — more than any other loader its size. Means you get the job done — faster, easier — in toughest going.

If you are after all-out production at the pile, if your hauls are long . . . if loading work is scattered and you want to go from one job to another in a hurry — then the TL-14 with a full power-shift transmission can't be beat. A demonstration will convince you.



The TL-14 has MORE of everything! More Reach — dumps right into center of high body trucks. More Carry Capacity — 5,300 lb. More Breakout Force — 18,800 lb. More Power — 86 hp gasoline, 83 hp diesel. And there's a family of six buckets to choose from — 1 to 3 cu yd.

for a wheel loader

For All-Out Savings...

TL-14 with TRACTOMATIC TRANSMISSION

simple design • economical • power-operated

Now you can get a transmission that gives you the ease of operation you want at big savings. The optional TRACTOMATIC transmission for the TL-14 TRACTOLOADER is hydraulically operated and simple in design.

Because there are fewer parts and gears and only two clutches (easy to get at), the price and maintenance of the TRACTOMATIC is considerably less than a full power-shift transmission. This means a lower first cost for the TL-14 . . . lower upkeep, easier servicing throughout its life.

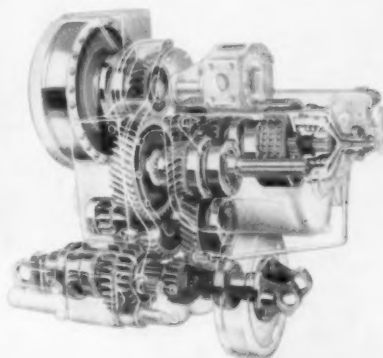
Extensive field tests prove that the TL-14 with a TRACTOMATIC transmission will perform as well or better than other loaders with full power-shift transmissions on short-haul loading and stockpiling.

If you want a good, reliable, easy-operating loader, you can really save money by choosing the TRACTOMATIC transmission for your TL-14. Ask your Allis-Chalmers dealer to show you what it can do. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wis.

FAST, EASY SHIFT — Operator just flips a lever on the steering column to go forward or reverse. Since the reverse speeds are 30 percent faster than forward, you get the extra back-away speed you want without shifting into a higher gear. To get this higher reverse on most other loaders, two separate levers would have to be moved.



HYDRAULICALLY OPERATED — Note the simple, compact design of the TRACTOMATIC transmission in this cutaway. Two multiple-disc clutches — just outside the transmission — are hydraulically actuated and share the work load. One is for forward, the other reverse. As one works, the other rests and cools — an important contribution to long clutch life. Both are accessible for quick adjustment.



move ahead with **ALLIS-CHALMERS**

...power for a growing world

Reinforced Concrete Pipe specified for



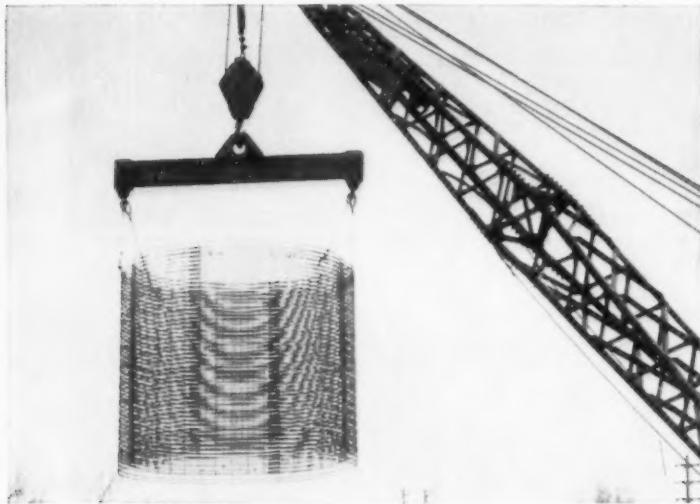
The contractor was able to lay 15 to 20 sections of 8-foot pipe in 8-hour work shifts. This rapid progression indicates the exactness of the sections of concrete pipe furnished to the job. The contractor used care in keeping

the trench walls vertical and narrow. Since the load-bearing capacity of the pipe is greatly influenced by the width of the trench, this type of installation is desirable and can be accomplished without special labor or equipment.

Visintine & Company and The Complete General Construction Co., Columbus, Ohio—Contractors

Price Brothers, Columbus, Ohio—Pipe Manufacturers

40-foot depth on Ohio Interstate Highway



The 2 cages of American Welded Wire Fabric are tied together at both the top and bottom with $\frac{1}{2}$ " diameter stirrups. These stirrups increase the ultimate strength of the pipe and resist diagonal tension at top and bottom sections. If the circumferential steel were not accurately spaced, it would be difficult to place the stirrups in the positions required for best performance. This consideration, plus the over-all economy of using readily fabricated American Welded Wire Fabric, led to its selection.



Over-all view of the trench digging and pipe laying operations. You will notice that the 40-foot trench is open cut using a dragline down to the first level and then a back hoe to the 40-foot level. This sequence of operations enabled the trenching operation to proceed very rapidly. The back hoe digging the final trench provided the extremely straight and narrow trench for best installation.

In Columbus, Ohio, work is progressing on one leg of the important new North-South Freeway. 96" dia. reinforced concrete pipe was specified for a 40-foot depth installation. This was included in one of the largest contracts ever let by the state of Ohio.

The state of Ohio special specifications were followed and each phase of the pipe manufacture and installation was inspected by representatives of the state. The pipe was required to withstand 24,000 # per ft. for the 0.01" crack, and 32,000 # per ft. for the ultimate strength. The actual three-edge bearing test results showed the pipe passed these requirements with flying colors. The 0.01" crack did not appear until 26,000 # per ft., and the ultimate was not reached until the load reached 39,200 # per ft.

Produced by Price Brothers, Columbus, Ohio, the 8-foot sections of pipe with an $8\frac{1}{2}$ " wall of 5,000-lb. concrete, were constructed with two reinforcing cages of USS American Welded Wire Fabric. The outside cage is style 2" x 8"—0.4375" x 5 gauge and the inside cage is style 2" x 8"—0.505" x 5 gauge. More than 400 stirrups were positioned between the fabric cages for each 8-foot section to increase the resistance to diagonal tension and improve the pipe's ultimate strength.

The production of concrete pipe is closely controlled and numerous tests are conducted to assure design strength. High quality reinforcing steel is an essential ingredient for top-quality pipe. That is why USS American Welded Wire Fabric was chosen to reinforce the concrete pipe for this job. It is machine-made by electrically welding high tensile strength steel wires made to exacting specifications. The guaranteed minimum yield point is 60,000 psi and the guaranteed ultimate strength is 75,000 psi. All members are spaced to the close tolerances of plus or minus $\frac{1}{4}$ " on centers. Because of the accurate machine prefabrication of USS American Welded Wire Fabric the two concentric cages can be formed faster.

Complete technical information on USS American Welded Wire Fabric is available. Just write to American Steel & Wire, Dept. 9263, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

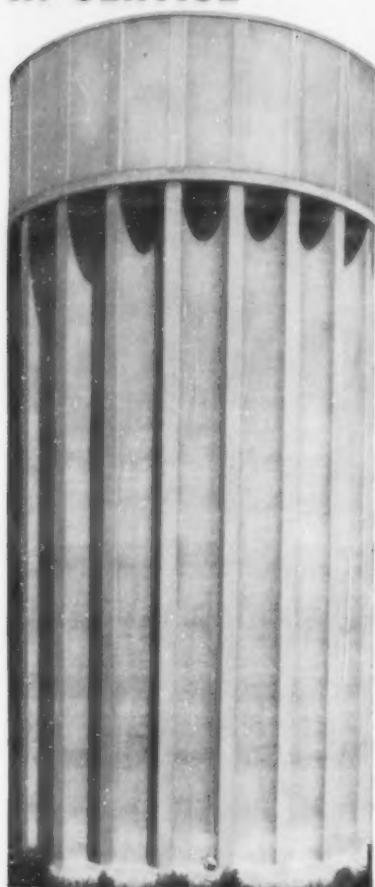
USS and American are registered trademarks

**American Steel & Wire
Division of
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Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
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Montreal 16, Canada



LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Error in Bid

Hedden v. Northampton Area Joint School Authority, 396 Pa. 328, 152 Atl. 2d 463; a Pennsylvania case decided June 30, 1959, was an action by contractors and their sureties seeking a return and cancellation of their bid bond in the amount of \$47,000.

Plaintiffs had submitted a sealed bid for general construction work on a new high school, in the amount of \$913,000, together with the surety bond.

The School Authority received 10 bids, the others ranging from \$995,595 to \$1,199,000.

After the bids were opened and plaintiffs learned of the big difference in their bid, they re-examined their work sheets and discovered that they had made an error in addition of \$90,000 in the work sheets, so that an incorrect subtotal was carried over into the bid.

The Supreme Court of Pennsylvania refused any relief to the plaintiff.

Informalities in Bidding

R. Michelotti & Sons, Inc. v. Fair Lawn, 56 N. J. Super. 199, 152 Atl. 2d 369, a New Jersey case decided June 10, 1959, was an action by an unsuccessful bidder, seeking to invalidate a resolution of the governing body of the borough of Fair Lawn awarding a contract for the construction of a public improvement, and to have the borough award the contract to the plaintiff.

The borough, in calling for bids, reserved the right to waive informalities in bids. The lowest bid was submitted with a check in the proper amount, but uncertified instead of certified as required by the specification and advertised notice to bidders.

The governing body of the borough waived this informality, accepted the bid as the lowest re-

sponsible bid, and adopted a resolution awarding the contract to the lowest bidder. The check was later certified.

The plaintiff argued that the waiver affected the fairness and competitiveness of the bidding. The court held, however, that this irregularity was not a "material departure", "substantial non-compliance", or a "substantial variation", and therefore upheld the resolution and the contract, denying the plaintiff relief.

Leakage from City Water Line

Luterman v. City of Philadelphia, 396 Pa. 301, 152 Atl. 2d 464, a Pennsylvania case decided June 30, 1959, involved a suit by a store owner to recover damages against the City of Philadelphia by reason of the flooding of his premises by water which had leaked from the city water line adjacent to their property.

A fire hydrant had been struck in front of plaintiff's premises and damaged by an automobile truck, necessitating its removal and replacement by employees of the city's water department. In order to replace the broken hydrant, it was necessary for the workmen to excavate around it to a depth sufficient to reach the connection between the hydrant and the water main. The work was not completed on the first day, and when the city's employees returned the next morning the plaintiff's premises were flooded with water.

Plaintiff argued that the city was negligent in failing to take adequate measures while repairing the damage so as to prevent water from escaping into plaintiff's adjoining business premises.

There was some conflict in the evidence as to whether water was still leaking from the hydrant when the employees of the city left for the

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BY ENGINEERS THE WORLD OVER...



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For 7 years now, in U.S. and Canada, contractors of every size, industrial, government and military field men have tried and proved the Zeiss automatic level (K&E NP5028). They all concur: it's faster to use, far simpler . . . and far more accurate.

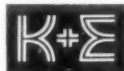
With the Zeiss even a beginner can close with the speed and accuracy of a veteran. Rough level *just once* and go to work. Eliminated for good is the headache of constantly recentering a telescope bubble. The force of gravity does the job automatically, acting on a pendulum-suspended prism. Job time, on an average, is *cut in half!*

A book could be written about the success stories of this remarkable instrument. As a matter of fact, one has been . . . a fascinating collection of case histories from around the world.

The book is full of worthwhile tips and techniques. It's free, and a copy can be yours in a week or so, if you write for it, today.

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of the Zeiss level casebook, write to Keuffel & Esser Co., Hoboken, N. J., Dept. PW-12. The Zeiss Automatic Level (K&E NP5028) is sold exclusively through K&E dealers.



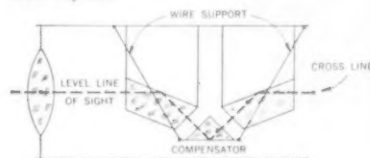
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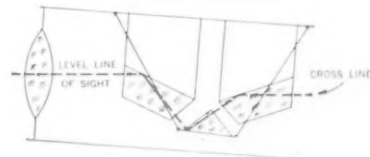
PUBLIC WORKS for December, 1959

How does the Ni 2 work?

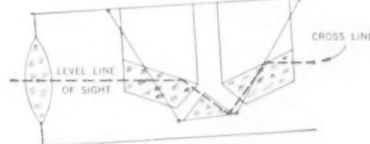
A built-in compensator . . . a lower prism suspended by specially treated fine wires . . . automatically maintains a level line of sight through the pull of gravity, as these illustrations explain.



Telescope horizontal



When telescope tilts up,
compensator swings backward



When telescope tilts down,
compensator swings forward

**AUTOMATIC COMPENSATOR ALWAYS
MAINTAINS A LEVEL LINE OF SIGHT**

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Public Works Officials in Many Cities, Counties, States and Provinces

**MAKE BUDGET DOLLARS DO MORE WITH
AIRPLACO CONCRETE GUNNING EQUIPMENT**

**When the Job Calls
for Concrete . . . Call for**



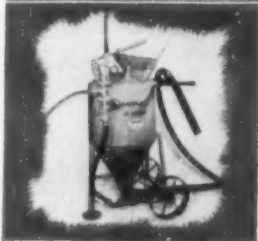
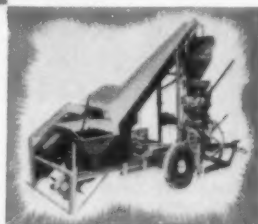
AIRPLACO CONCRETE GUNS for Restoration and Repair of Roads, Streets, Bridges, Culverts, etc. Choose from six different models in a complete line of concrete guns. Whatever your production requirements—from $\frac{1}{2}$ to 8 cu. yds. per hour—there is an AIRPLACO BONDACITOR or NUCRETOR to meet your needs.

AIRPLACO MIX-ELVATORS

for Faster, Easier Proportioning, Mixing, Elevating and Screening. Choose from three models. Capacity up to 12 yds. per hour.

AIRPLACO GROUTER AND PLACER

for Easy-to-Use, Versatile Grouting and Placing of Concrete and Other Materials. The portable Model G-6 Grouter and CP-10 Placer is ideal for soil stabilization, tunnel backfilling, filling hard to get to forms, etc. Both the G-6 and CP-10 have capacities of up to 5 cu. yds. or more depending on materials used and job conditions.



AIRPLACO JET-BLASTERS For Low-Cost, Easy-to-Use Sandblasting (wet or dry). The Model B-6 single charge (650-lb. capacity) and B-3C continuous feed (500-lb. capacity) Jet-Blasters are designed to handle all abrasive materials for cleaning, polishing, or etching of any type of surface. Jet-Blasters are available with accessories for wet or dry blasting and new exclusive "Sand-Saver" remote cut-off valve.

Let Us Help You Solve Your Concrete Problems. Our experience in solving unique problems involving the handling of concrete has saved thousands of dollars for others. This experience is available to you. Write, wire or phone us, anytime.



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WORLD'S LEADING MANUFACTURER OF "ADVANCED DESIGN" PNEUMATIC PLACING EQUIPMENT

day, and as to whether there was water in the excavation made by the city.

The jury held in favor of the city. On appeal, plaintiff argued that the judge had improperly instructed the jury that the city was not bound to anticipate that a third party might interfere or tamper with what had been done, and that it was sufficient to erect barricades and lights, without posting a policeman. The Supreme Court of Pennsylvania upheld these instructions as correct, and denied relief to the plaintiff.

• • •

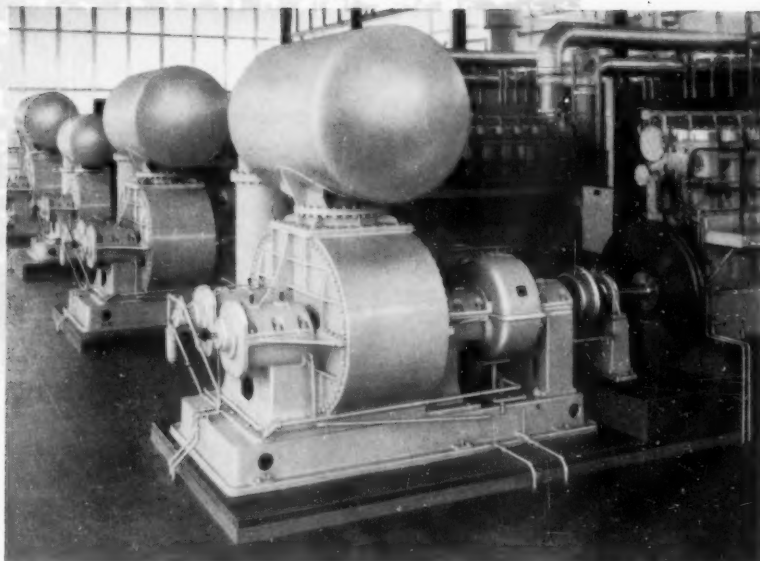
Locksmith Shop Has Special Trucks

The Locksmith Shop of the City and County of San Francisco cuts over 11,000 keys annually, many of them involving master and grand master keying arrangements including those for prisons. In this work security is a prime requisite. In addition to a limited floor area, the shop has two completely equipped $\frac{3}{4}$ -ton panel trucks, capable of performing almost any required activity at the job site. These trucks were planned and developed by the lockshop personnel, and are equipped with all necessary accessories. These include work benches, key and tool cabinets, parts cabinets and drawers, vises, grinders, buffers, key duplicating machines, and in addition, the portable electric tools required for this activity. To handle this equipment, the trucks are equipped with small gas engine driven electric generators, which can, if necessary, be removed from the trucks for repairs or used as an emergency power source elsewhere.

Radiology and Water Supplies

The Radiological Health Aspects of Water Supply will be the subject of the Second Sanitary Engineering Conference to be conducted jointly by the Bureau of Public Water Supplies, Division of Sanitary Engineering, Illinois State Dept. of Public Health and the Department of Civil Engineering of the University of Illinois. This conference will be held on the campus of the University of Illinois in Urbana, on January 27 and 28, 1960. Further information from Wm. J. Downer, Assistant Chief Sanitary Engineer, Dept. of Public Health, Springfield, Illinois, or from Dr. Ben B. Ewing, Associate Professor of Sanitary Engineering, Dept. of Civil Engineering, University of Illinois, Urbana, Illinois.

IN TOLEDO,
ON THE SITE
WHERE DEMPSEY
KNOCKED OUT
WILLARD...



Engineers—Consoer-Townsend & Associates

ROOTS AERATION BLOWERS PROVIDE THE "KNOCK-OUT" IN SEWAGE TREATMENT

Roots-Connersville equipment in the heart of the outstanding Toledo installation includes four large rotary blowers driven by Enterprise tri-fuel diesel engines and one Electric Machinery synchronous motor-driven blower. The Roots blowers supply a total of 80,000 cfm of air at 4 to 8 psi. Infinite control of the volume of air delivered to the aeration tanks is achieved through the use of multiple units which can also be operated at variable speeds.

Roots rotary blowers adapt uniquely to the Kraus process utilized in the Toledo Sewage Treatment Plant. The same blowers are capable of supplying the four pound (high level) or the eight pound (low level) aeration systems. The "load following" characteristic of rotary positive displacement blowers results in power savings and minimum operating costs.

Design advantages of the Roots blowers selected for the Toledo plant include:

- **SPEEDS**—conservative operating speeds contribute to quiet operation, low maintenance and long service life.

- **OPERATING ECONOMY**—horsepower requirements determined by actual operating pressure.
- **DRIVE FLEXIBILITY**—may be direct-coupled, belt-driven or geared to engines or electric motors.
- **CAPACITY RANGE**—wide selection of sizes up to 25,000 cfm for pressures to 10 psi.
- **CONSTANT VOLUME**—constant volume delivered regardless of temperature or pressure requirements.
- **EFFICIENCY**—high volumetric efficiency assured with minimum slippage.

Additional data about Roots-Connersville equipment appear in Chemical Engineering Catalog and The Sewerage Manual. For design information and specification data covering Roots rotary or centrifugal blowers, gas meters and vacuum pumps write or call your R-C Field Engineer, or write for the following bulletins: *Rotary blowers* . . . Bulletin RAS-158 or Bulletin RB-154; *Centrifugal blowers* . . . Bulletin 120-B-14; *Vacuum pumps* . . . Bulletin VP-158; *Gas meters* . . . Bulletin M-258.



ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

1259 Poplar Ave., Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto



Why the thin sidewall of a Beth-Cu-Loy



A 28-ft., 16-gage Beth-Cu-Loy sheet steel culvert demonstrates its ability to flex longitudinally. This illustrates how Beth-Cu-Loy drainage structures can easily be made to conform to curves and changes in grade.

culvert pipe is the secret of its strength

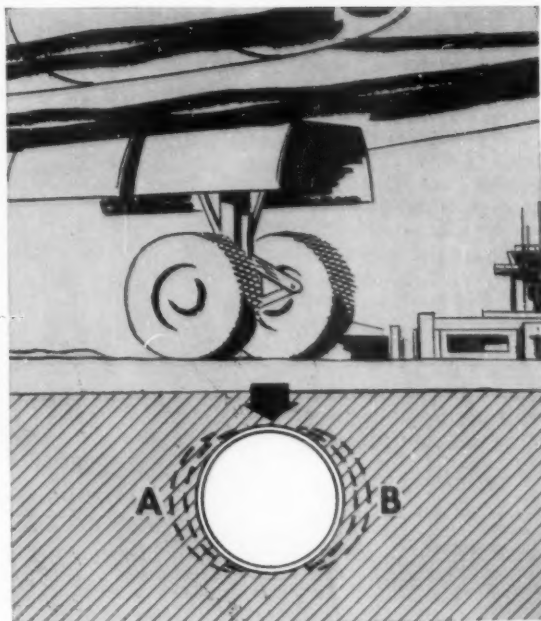
Looking head-on at a drainage structure made from galvanized corrugated Beth-Cu-Loy steel sheets, you might wonder how those thin side-walls can support the load. Yet that very thinness gives Beth-Cu-Loy pipe one of its strongest advantages: flexibility.

Pipe made from Beth-Cu-Loy is flexible both transversely and longitudinally. Because of the latter, easy curves in the line can be made without special fittings or connections. But its transverse flexibility is even more of an advantage.

Makes Use of Surrounding Material

Because of this flexibility, a culvert or drainage pipe made from Beth-Cu-Loy sheets can make use of the surrounding material to support imposed loads. In the drawing above, for example, the load produces controlled deflection in the pipe. As points A and B move into and compact the trench walls, a load begins to develop around these points, spreading the pressures peripherally. Thus flexibility accounts in large part for the ability of corrugated steel pipe to carry the load.

Not so with rigid pipe of the type used for drainage. It cannot flex with the load, thus can-



Exaggerated for clarity, this drawing shows action of Beth-Cu-Loy pipe under load. Pressure against fill, at points A and B, sets up counter-loads which largely offset the forces through the vertical axis.

not transfer a significant portion of the forces to the surrounding material. The bulk of the pressure is exerted through the vertical axis of the pipe.

Bethlehem furnishes galvanized corrugated Beth-Cu-Loy (copper-bearing steel) sheets to fabricators who make culvert pipe and other drainage structures. Beth-Cu-Loy meets the specs of the AASHTO. For full details, just get in touch with the nearest Bethlehem sales office, or write to the address shown here.

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If your hauls are getting longer, here's the system for you. The Dumpmaster handles 1/2 through 8 cu. yd. containers . . . gives you all the advantages of rat-proof, scatter-proof, fire-proof, enclosed refuse storage . . . plus peak efficiency when used on hand-loaded routes. It's safe! Clearance arms bridge cab. Economical! Hydraulically compacts 50 to 120 cu. yds. of loose refuse per trip, depending on the model. One-man operated, all operations automatically controlled from cab . . . in use from coast to coast.

Covered by U.S. Letters Patent No. 2,900,096



The DEMPSTER-DUMPSTER System of one truck handling any number of containers has saved municipalities many millions of dollars. All-steel, enclosed, sanitary containers are available up to 15 cu. yd. capacity. Patented sump-bottom containers available for wet or moist refuse. One man, the driver, picks up, hauls, dumps and returns the empty container . . . handles hundreds of yards of refuse daily. Now in use in hundreds of progressive cities.

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How YOUR City Can Get a Scientific Analysis of its

Methods and techniques of mechanized refuse handling have undergone many revolutionary changes in the last 18 months. That's why far-sighted city officials from coast to coast are surveying . . . examining and comparing their present systems against these new developments.

Disposal areas are moving farther and farther out; new shopping, commercial and manufacturing areas are springing up to compound the city's refuse disposal problems and throw more burden on the tax

dollar. To meet these specific problems, new equipment has been developed—some fits in one situation . . . doesn't fit in another.

Dempster Brothers maintains a staff of trained survey engineers who are specialists in analyzing methods of refuse storage, collection, transportation and disposal.

These skilled men are available to assist your planning groups *without cost or obligation*. Each year these engineers make hundreds of surveys in cities

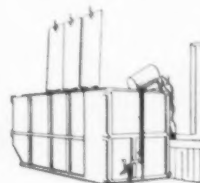
refuse disposal costs

DEMPSTER[®] DINOSAUR

All structures shown are
Patented or Patents Pending
Mfd. by
DEMPSTER BROTHERS
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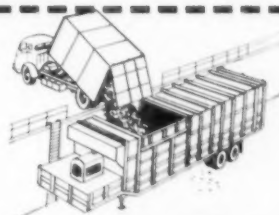


The DINOSAUR handles detachable containers up to 40 cu. yds. and over, with gross loads of up to 15 tons. One man, the driver, picks up, hauls and dumps or puts down the giant containers on platform, ground or legs. Everything is handled hydraulically from controls in the cab . . . no winches, cables or sheaves. Can handle two or more containers at a time. Big capacity and big pay loads beat the long-haul problem. Excellent for use at big refuse generation points or as a portable transfer station for conventional packers.



DEMPSTER COMPACTION TRAILER & GRD 304-F-2

Big-capacity hydraulic compaction trailers have own power plant, haul up to 200 cu. yds. of loose material on every trip to the disposal area. Can be loaded with GRD 304-F-2, or ramp-loaded by DEMPSTER-DUMPSTERS, or conventional packer trucks. Available in two sizes, 42 and 53 cu. yds.



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large and small. They meet and consult with municipal personnel at all levels, analyze costs, ordinances, capital outlay and then present a comprehensive report that compares present methods with other available techniques. Because of their experience and broad knowledge of all types of equipment, they are able to make many valuable suggestions even when Dempster Brothers equipment is not indicated.

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Please send: ☐ Information on Free Survey

Free Brochures on ☐ Dumpmaster ☐ Dinosaur

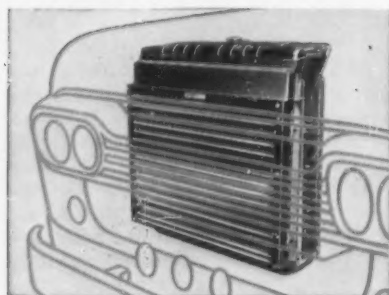
☐ Dumpster ☐ Trailer and GRD 304-F-2.

Name _____ Title _____

Address _____

City _____ State _____

NOW! Certified Durability



CLOSER TEMPERATURE CONTROL obtained with automatic radiator shutters means longer engine life, more efficient operation. Temperature variation between 167° and 187° with shutters as compared to 102° to 181° without shutters was reported and certified in loaded vehicle road tests.



LONGER WIRING HARNESS LIFE is the direct result of Ford's greatly improved electrical wiring system for 1960. Ford's '60 wiring harness and the 1959 wiring harness were subjected to shaker table tests plus constant exposure to oil and water vapors, and temperatures of 200°. Certified test results show a threefold increase in 1960 wiring harness life.



INCREASED FUEL PUMP RELIABILITY is an added benefit from Ford's submerged-type electric fuel pump. Certified results of dynamometer tests showed no vapor lock with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical fuel pump resulted in a power loss of 9% under same conditions.

It's a fact! Numerous reports from high-mileage operators of Super Duty Trucks attest to Ford's outstanding durability. Studies by an independent research firm provide certified proof that these models are even more durable for 1960.

Ford Super Duty Trucks have earned a reputation for exceptional performance and durability since their introduction two years ago. Shop service records of many leading fleets show Super Duty tractors with mileage readings between 150,000 and 250,000 and no repairs other than normal maintenance. Similar testimony to the dependability of these Big V's by other satisfied users is being added each month. Is it any wonder that '59 sales of these units were more than double those of 1958?

And for 1960, the Ford Super Duties offer additional refinements. Bigger optional axles and increased GVW's to permit greater payloads and more profitable operation. Automatic radiator shutters to keep the engine temperatures within the most efficient operating range, improved submerged-type electric fuel pumps to prevent vapor lock, and redesigned wiring for more reliable operation are typical of the improvements to be found in these units.

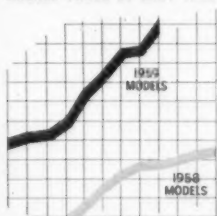
The changes offered for 1960 were tested and evaluated by a leading research organization. Certified results of the studies by this impartial firm (name available on request) provide proof that Ford's Super Duty Trucks are even more dependable.

- **Certified Durability through closer temperature control!** Independent research engineers certify that Ford's thermostatically controlled radiator shutters kept water temperature between 167° and 187° in severe mountain grade operation. The test truck with shutters blocked open under same operating conditions had a temperature range from 102° to 181°. The temperature variation of only 20° with shutters means less expansion and contraction in block and heads. Higher, more constant temperatures permit oil to circulate more freely, reducing internal friction. All these factors contribute to longer engine life.
- **Certified Reliability with longer-lived electrical system!** Thicker insulation on wires resists deterioration by heat, oil and gasoline. Asphalt-impregnated loom and plastic-coated mounting clips protect against abrasion. Certified results prove that the 1960 wiring harness has three times longer life.
- **Certified Reliability with Ford's submerged-type electric fuel pump!** Dynamometer tests of engines with submerged-type electric fuel pump and conventional mechanical type showed that vapor lock was non-existent with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical pump resulted in a power loss of 9% at an underhood temperature of 200°.

Endurance tests were run on alternators, two-speed axle speedometer adapters and other related components with similar results. Get all the facts at your Ford Dealer's now!

in Ford Super Duties!

1959 FORD SUPER DUTY
TRUCK SALES MORE THAN
DOUBLE THOSE OF LAST YEAR



"Our first Ford C-1000 tractor has logged 190,000 trouble-free miles since March of '58,"

says Robey W. Estes, Vice President and General Manager of Estes Express Lines, Richmond, Va. "We haven't had a single road failure and we only bring it into the shop for regular preventive maintenance work once a month.

"We use the 477 engine and find oil consumption is exceedingly low . . . only one or two quarts added between 3000-mile oil changes.

Engine compression at 190,000 miles is still high and fairly equal and our drivers say that power and pep are at about the same level as when the truck had been run only 60,000 miles.

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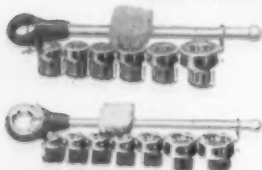
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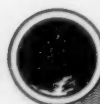
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Commentary

on
Water and Sewage
Treatment

WEIRS ON SEDIMENTATION TANKS

R. S. RANKIN

Consultant, Water and Sewage Treatment

THE LENGTH of weir required for sedimentation tanks in sewage treatment plants is a matter of fairly exact calculation according to the prescribed rules of some regulatory agencies. As standards or guide rules of such agencies are usually based on experience one naturally expects to find abundant operating records confirming the prescription. But any search will not be rewarding, because plant records contain little if any evidence to establish requirements for the length of weir for a given flow. One may logically question the reason for such rules and their justification.

One set of rules is contained in the Ten State Standards (1) which is as follows: "On circular tanks the weir should be equivalent in length to a weir extending around the entire periphery. Weir loadings *shall* not exceed 10,000 gal. per day per lin. ft. for plants designed for average flows of 1.0 MGD or less. Special consideration will be given to weir loadings for plants designed for flows in excess of 1.0 MGD but such loadings *should* preferably not exceed 15,000 gal. per day per lin. ft." (Italics by author.)

Just why circular tanks are mentioned and not rectangular is not clear, but presumably it is because of lack of any simple means of mathematical expression. The fact that the rule states in effect that circular tanks should have complete peripheral weirs would seem to imply that by so doing they will automatically fulfill the requirement and even tend to favor this type. Further reading will show additional requirements to be met which tend to offset any advantage. To obtain a rate of 10,000 GPD per ft. over a peripheral weir, a circular tank designed with an overflow rate of 600 GPD per sq. ft. of surface area is limited to a maximum of 66 ft. dia. With a weir rate of 15,000 GPD per ft. and an overflow rate of 800 GPD per sq. ft., a maximum of 75 ft. dia. is permitted with a single peripheral weir. Circular units of larger diameter, according to the rules, should have additional weir length which usually requires mounting the effluent channel on wall brackets with weirs on both sides, all at considerable cost.

In rectangular tanks, compliance with these rules

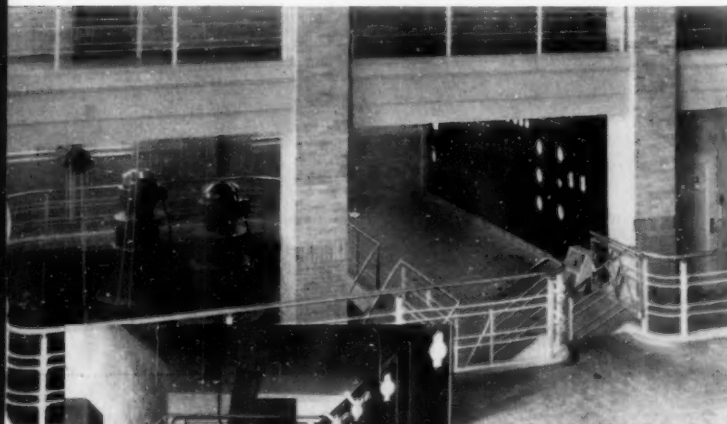
"AS SPECIFIED" Wilmette's Water Treatment Plant and Pumping Station is Equipped with Cutler-Hammer Control



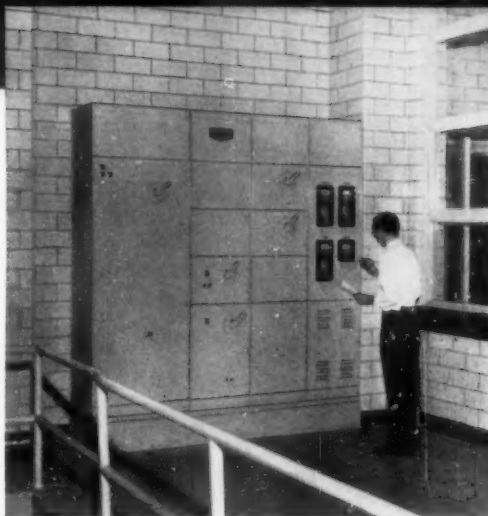
WILMETTE, ILLINOIS WATER TREATMENT PLANT & PUMPING STATION

Capacity: 15,000,000 gallons per day
 Superintendent of Public Works: Mr. A. Lund
 Chief Operator: Mr. W. W. Frye
 Consulting & Design Engineers: Alvord, Burdick & Howson
 Electrical Contractor: Sievert Electric Company

Main Entrance and pump room New vertical type 50 Hp low lift pumps and 300 Hp high lift pumps were installed in the existing pump room. The operator's panel was modernized to monitor both the new and existing pumping equipment.



Main Control center Cutler-Hammer Automatic Reduced Voltage Starters for the new low and high lift pumps and existing horizontal type pumps are grouped in the main control room located directly behind the operator's panel.



Auxiliary Control center A new four-section Unitrol® provides a compact control center for the new vertical type Wash Water Pump, Drain Pumps, Breaker Panel Disconnect, and custom-built meter unit.

The Wilmette, Illinois Water Treatment Plant and Pumping Station is typical of scores of Municipal Water Works which recently have been expanded to keep pace with their rapidly growing communities. Here the new 9,000,000 gallon per day addition has more than doubled the capacity of the plant which was built during the middle thirties. And in both instances Cutler-Hammer Control was installed "as specified" to direct and protect the electric motor driven pumps and equipment.

This repeated specification and selection of Cutler-Hammer Control is indicative of the users satisfaction with its performance during the past twenty-five years, and confidence in its operation in the future . . . Cutler-Hammer Control is built better to last longer.

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is also a serious and expensive problem because a single outlet weir across the end of the tank which one would normally expect to provide is seldom more than 25 to 30% of the required length. For example, a rectangular tank 16 ft. wide by 64 ft. long designed to operate at an overflow rate of 600 gal. and a weir rate of 10,000 gal. will require 61.5 lin. ft. of weir, while a 20-ft. by 60-ft. tank at an 800 gal. overflow rate and a 15,000 gal. weir rate will require a weir 64 ft. long. Thus to comply, multiple weirs in total length of between three and four times the tank width are required also at added cost of construction, not to mention the increased operating burden of cleaning the weirs.

These typical examples refer to primary sewage sedimentation units and the question which follows is whether the performance of such units has actually shown the need for such refinements. There is no evidence in published operating records of numerous plants to indicate that weir rates have any influence whatsoever on primary tank efficiencies. Reference to the tables of performance of such units in the Manual of Practice of Sewage Treatment Plant Design (2) shows circular tanks with weir rates of 58,000 GPD per lin. ft. in 170-ft. dia. tanks removing 61% of suspended solids and rectangular tanks with weir rates of 215,000 GPD per lin. ft. in 50-ft. by 124-ft. units removing 55% of suspended solids. Several other examples in these tables show units with weir rates far above the stipulated maximums, and any careful study of these as well as numerous other published records will show the major influence on performance to be overflow rate with weir rate of practically no significance.

How this regulation originated is, of course, unknown but the theoretical dissertation on weir rates in the N R C Report on Sewage Treatment at Military Installations (3) was one influence which aroused interest in this hitherto disregarded factor. An equation developed in this report shows the theoretical zone of influence of the weir and the limiting rates for best performance. However, one interesting observation is the disparity between the actual performance in primary plants and the theoretical calculated influence of the weir rates. In the plants listed in the N R C Report no apparent effect of weir rates on removals of suspended solids is evident. Ingersoll and Associates (4) conclude for a rectangular tank that the theoretic-

cal influence of the outlet weir is to decrease the effective tank length and their remedy is, of course, to make the tank longer. While this may be correct theoretically, a longer tank will provide additional capacity for a greater flow based on surface rating, in turn requiring more weirs which will again reduce the effective length. Where their theory leads to is not clear.

Anyone who is familiar with the long rectangular Imhoff tanks quite common 30 to 40 years ago will recall that most of them had flow-through settling compartments from 10 to 20 ft. in width with a single outlet weir across the end. Weir rates were obviously many times those now required to comply with the foregoing rules yet removals of suspended solids in those earlier units were usually better than 60%. Incidentally, in these Imhoff tanks the overflow rate, a unit unknown in those earlier days, seldom exceeded 600 and more often was around 400 GPM per sq. ft.

On final tanks following activated sludge aeration, for larger plants the regulations permit an overflow rate of 1000 GPD per sq. ft. and the same weir rate of 15,000 GPD per lin. ft. For circular tanks this rule would limit them to 60 ft. in diameter unless weir length is increased beyond the single peripheral weir, a limitation disproved in many installations. However, Anderson (5) in tests carried out in circular tanks 126 ft. in dia. showed that a weir rate of 9900 GPD per lin. ft. produced an effluent averaging 10.6 PPM suspended solids; at a rate of 17,700 GPD 13.6 PPM; and at a rate of 28,200 GPD 18.2 PPM. For very large installations any decrease in solids in the effluent may justify increased expenditure for additional weirs but for most medium and small plants, the increase in weir length might be questioned. Furthermore, other factors such as overflow rate and settling characteristics of the sludge probably exert far greater performance on effluent quality in the smaller typical plant.

Even in water treatment units of the upflow type, there is no positive evidence that weir rates have any influence on performance. Weir rates several times those discussed here have been successfully used and rising blankets or similar disturbances can be traced to other causes.

Rather than impose any standards of design on details when the need is not fully proven and which will add to the cost of plants, it would seem desirable to make exhaustive

field tests and publish the findings where interested parties may review them and verify the need for limiting values. In this manner the public regulatory agencies can earn support for any standardization. There must be many factors influencing the performance of sedimentation tanks as yet unsolved because despite the advances in theoretical analyses of this process in recent years the percentage of solids removed shows little, if any, improvement over those 30 or 40 years ago. Progress has been made in the development of simplified tank designs which are more economical to construct and easier to operate, but any prediction of actual performance is still largely guesswork. Until more of this guesswork can be resolved it seems an unjustified refinement to attempt to regulate such abstract features as the length of weirs.

References

- 1) Standards for Sewage Works, Upper Mississippi Board of Public Health Engineers and Great Lakes Board of Public Health Engineers.
- 2) Manual of Practice of Sewage Treatment Plant Design, FSIWA Manual No. 8, ASCE Manual No. 36.
- 3) Sewage Treatment at Military Installations Chapter IV. Sedimentation, SWJ 1946, pg. 876.
- 4) Fundamental Concepts of Rectangular Settling Tanks by Alfred C. Ingersoll, Jack E. McKee and Norman H. Brooks Trans. ASCE Vol 121, 1956, pg. 1179.
- 5) Design of Final Settling Tanks for Activated Sludge, Norval E. Anderson, SWJ Vol. 17, 1945, pg. 50.

Replacing and Purchasing Equipment

On a questionnaire sent by PUBLIC WORKS Magazine to city engineers and managers, directors of public works and superintendents of streets, the following questions were asked: Do you have a schedule for replacing worn or aged equipment? and is replacement equipment purchased on a selective basis, by low bid or a combination of both?

Concerning a schedule for replacing equipment, a total of 1,073 replies were received. Of these, 578 cities reported that they had a schedule and 495 said that they did not follow any set plan.

There were 1,374 replies to the question on how equipment is purchased. The large majority, 905, indicated that equipment for their cities is selected on a combination of both the low bid and selective basis; 74 said that equipment is purchased on a selective basis alone; and 395 answered that they bought only on the low bid basis.

Mayor R. Dewey Stearns says...

"Saginaw's modern water system pays for itself 365 days a year!"

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"**Because good water** is vital to the life and growth of Saginaw, we go to one of the best raw water sources in the Midwest . . . to Lake Huron for a limitless supply of the finest and purest water."



"**A water system** must undergo continuous expansion to meet growing domestic, industrial and fire protection needs. Transite Pipe has helped Saginaw expand economically and efficiently since we first used it in 1933."

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For information on how Transite Water Pipe (and Transite Sewer Pipe, too) can serve your city write Johns-Manville, Dept. N-9, Box 14, New York 16, N.Y.

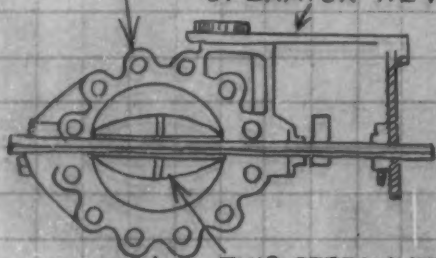
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Radiation Sources To Be Registered In New Jersey

Recently the New Jersey State Department of Health began registration of radiation sources within New Jersey, as required by Chapter 116, Public Laws of 1958—the Radiation Protection Act. The Department will first register radiation-producing machines (X-ray machines, fluoroscopic machines, electron-microscopes, particle accelerators, high voltage rectifiers, etc.). Later, materials that produce radiation, such as isotopes, will be similarly registered.

A card will be sent by the Department to industrial concerns and organizations, as well as individuals who are known to use radiation-producing machines. Those who return the card and indicate that they have such machines will be sent a registration document to complete.

The following types of machines, according to the Department, are exempt from registration:

1. Radiation machines not being used in such a manner as to produce radiation. (In storage, at a sales agency, or at a location of normal use and not connected with a power source.)
2. Electrical equipment not primarily intended to produce radiation and that does not produce radiation greater than 0.1 millirem per hour at the point of nearest approach. (Production testing of such equipment, however, is not exempt.)

A non-salaried Commission on Radiation Protection has been created within the New Jersey Department of Health under the terms of the Radiation Protection Act. This Commission is endeavoring to develop reasonable and practical measures to protect the public against injurious radiation. It is expected that these measures will take the form of a code or codes.

ASCE Sanitary Engineering Division Conference

A conference of the Sanitary Engineering Division of the ASCE will be held in Cincinnati, O., Jan. 6 to 8. The topic will be "Economics of Pollution Control" and the program will consider pollution control from the land, air and water standpoints. The meeting will be at the Netherland-Hilton Hotel. Arthur D. Caster is Conference Chairman. The list of speakers is impressive, including Dr. Arthur Flemming, Dr. Abel Wolman, Senator Robert S. Kerr and many leading engineers.

Sewage Flow Measurements

Routine sewage flow measurement work as required for the proper use and development of the Los Angeles, Calif., sewerage system and special measurements for the study of specific areas were accomplished by driving 24,580 miles and by gauging 29,400 manholes. In addition to routine flow measurements, 793 hydrographs were obtained to determine the quantity of sewage contributed by contractual agencies.

Executive Training Program

An executive training program has been started by the New York University Graduate School of Public Administration in cooperation with the New York City Department of Personnel. A grant of \$250,000 has been received from the Ford Foundation. The training program will run 30 weeks, covering seven programs in 90 hours of study. The course will provide conferences as follows: A full day a week for 15



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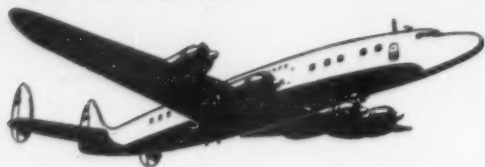
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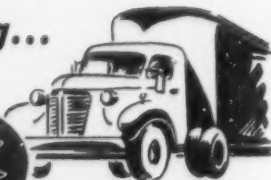
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This unique plow, with curved, tapered mold-board, operates safely at high speed . . . throws and spreads snow to eliminate high banks and subsequent drifting. And when the job is done, quickly and economically, the Roll-Over parks upright within its truck's width. For full details, write to Frink for catalog.

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weeks; one morning a week for 30 weeks; one evening a week for 30 weeks; six days a week for two weeks; five days a week for three weeks; a correspondence program; and a home study program.

Areas covered will include: Improving decision-making processes; formulating and executing program objectives; communication with the organization; human relationships in administration; evaluating program effectiveness; and the administrator's role in inter-agency and inter-jurisdictional relations.

The initial group included 43 deputy commissioners, executive officers and bureau directors from 18 New York City Departments and four suburban municipalities.

ARBA Plans to Improve Highway Engineering Instruction

Plans to promote and foster the extension and improvement of instruction in highway engineering have been adopted as a major objective of the Educational Division of the American Road Builders' Association. A seven-point program of expanded effort was developed by members of the committee. The specific objectives adopted are:

1) To improve existing courses in highway engineering by directing attention to modern teaching aids demonstrating proper use of materials and equipment, proper design and standard construction practices.

2) To assist colleges in initiating and developing curricula in modern highway engineering.

3) To develop effective procedures in highway engineering teaching.

4) To promote and support conferences and short courses for highway engineers and local highway officials and highway construction personnel.

5) To expand student membership in ARBA and to establish an active program in support of student chapters.

6) To cooperate with industry in organization of summer work programs for students and instructors of highway engineering.

7) To develop effective participation of engineering educators in technical committee activities of ARBA.

The committee also decided on a revamping of the Division's committee structure, in order to provide a more effective framework for action. Emmett H. Karrer, Professor of Highway Engineering at The Ohio State University, is President of the Educational Division and Chairman of the Executive Committee.

New Mosquito Light Trap

The Research and Development Laboratories of the Corps of Engineers at Fort Belvoir have developed a new aluminum mosquito-light trap that has proved under tests to be more rugged and corrosive-resistant than standard models. The purpose of the mosquito-light trap is to catch a representative sample of a mosquito population to determine the density and the species for establishing controls and measuring their effectiveness.

Now standard Army equipment, the new trap consists of an aluminum frame, a cover-protected light bulb, a 10-milli-horsepower, electric motor driven fan, a screen cone and a collecting jar. Mosquitoes attracted by the light are blown by the fan down through a screen cone into a plastic jar where they are killed by sodium cyanide or paradichlorobenzene. The trap operates on a 110-volt line, and is controlled by an automatic electric timer.

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FOR MIXED BRUSH—LINE RIDER LV-3D/3T, a 2-Ethyl Hexyl Ester formulation of 2,4-D and 2,4,5-T containing 3 pounds each of acid equivalent per gallon.

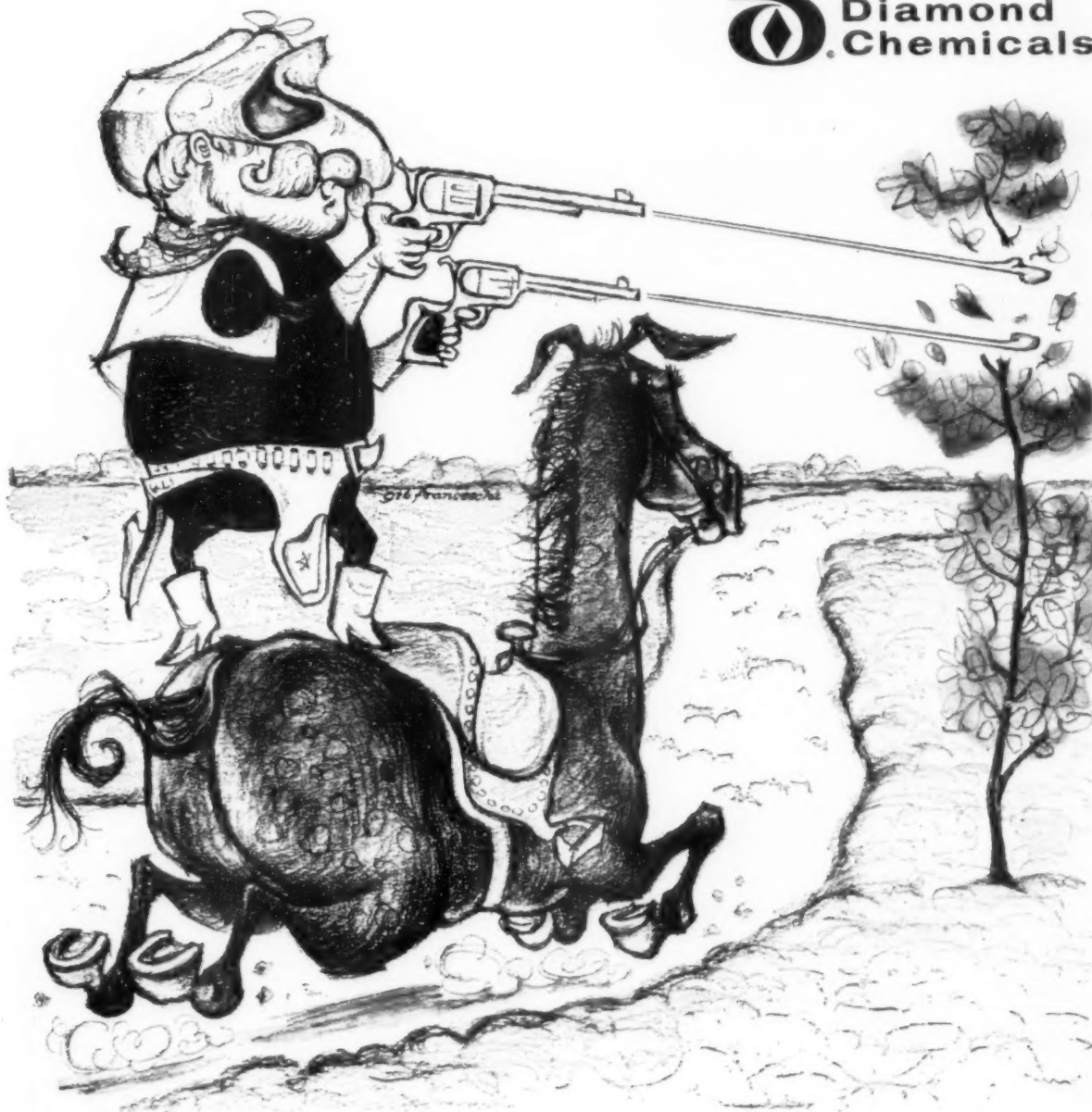
FOR MAPLES AND OAKS—LINE RIDER LV-6T, a 2-Ethyl Hexyl Ester formulation of 2,4,5-T containing 6 pounds of acid equivalent per gallon.

FOR AREAS ADJACENT TO SENSITIVE CROPS—LINE RIDER AMINE 22, alkyl amine salt formulation of 2,4-D and 2,4,5-T containing 2 pounds each acid equivalent per gallon. Applied as a water-borne spray.

FOR SPECIAL CONDITIONS—LINE RIDER formulations, including Butyl and Low Volatile Esters of 2, 4-D and 2, 4, 5-T containing 4 pounds acid equivalent per gallon.

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pleasing combination of texture and color. In addition, the use of precast panels saved construction time. And the building will keep its fresh beauty for a lifetime.

Architects and engineers everywhere will tell you: Versatile concrete is the one building material that offers unlimited new design possibilities for structures of all kinds. Write for free literature on precast panels. (U.S. and Canada only.)

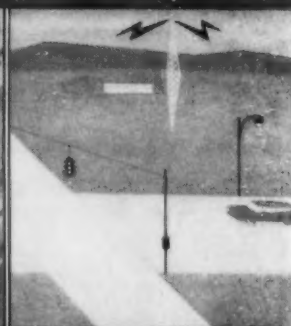
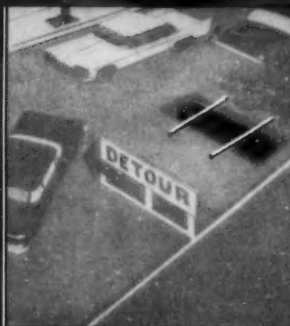
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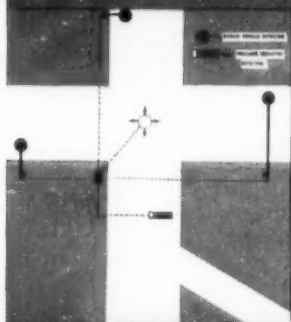


1. Now the new Model RD-2 Radar Vehicle Detector meets requirements of all types of traffic-actuated signal controllers.

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Municipal Power

Preparation of an Electric Revenue Bond Prospectus

BRUCE J. ENNIS

Principal Engineer,

Burns & McDonnell Engineering Co.

Kansas City, Missouri

FUNDS for the construction of minor system improvements are usually obtained from annual net income accrued from the business conducted in prior years by the electric utility. If operating revenues have been large enough to defray operating expenses, fixed charges, and taxes, with sufficient net earnings left over to finance the construction of normal additions to the system, then there is, of course, no reason to consider the issuance of revenue bonds.

Such a condition may obtain for many years, wherein net earnings are sufficient to take care of pole line extensions, new customer services, an occasional substation or two, and similar improvements necessary to keep the system capabilities abreast of load growth.

It is only at times when major improvements are necessary, requiring large scale financing in excess of accumulated net earnings, that recourse must be made to offering for sale a revenue bond issue in which the bonds, by which construction funds are raised, are secured by a pledge of, and lien upon the revenues, profits and income of subsequent electric system business. Such improvements might include an additional unit in a generating station, a major conversion or construction program for the distribution system, the construction of large transmission lines or substations, and the like.

Obviously, the preparation of a prospectus requesting proposals for the purchase of electric revenue bonds is a matter requiring the services and guidance of the utility's attorney and bond counsel, to assure compliance with applicable legal requirements, to schedule maturity serial dates in proper relation

with utility financing programs, and to pass on proceedings associated with the bond issue.

In addition to the legal phases in the preparation of a bond prospectus, however, it is equally important to set forth therein the fiscal and physical condition of the electric system properties in a thorough and complete form designed to present all pertinent facts relating to system investments, revenues, properties, capabilities, and annual net income available for the amortization of the proposed revenue bond issue. It is a matter of considerable importance to prepare a well documented prospectus for, by so doing, it is generally possible to attract more prospective purchasers for the bond issue with lower resultant interest rates.

There is no rigidly prescribed format for the revenue bond prospectus, although certain information is usually included in a manner somewhat as shown in the following typical exemplary outline form:

(1) Notice of Bond Sale: Includes name of utility, amount of bond issue, and date for receipt of sealed proposals.

(2) Schedule of desired maturity dates by bond serial numbers, and redemption options.

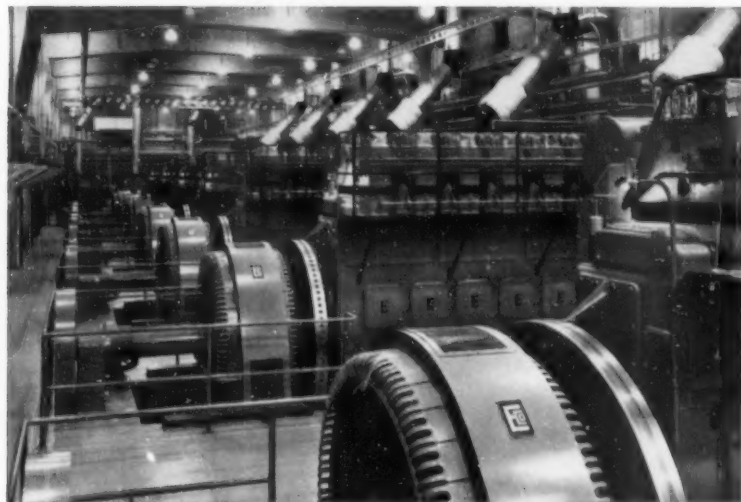
(3) Procedure for submittal of proposals for the purchase of bonds, including amount for bid deposit check.

(4) Purpose of Issue: A description of the nature and extent of the construction work and system improvements to be financed by the proceeds of the revenue bond sale.

(5) Authority for the Bonds: A statement regarding municipal action, public referendum election, and the like, authorizing the issuance of the revenue bonds.

(6) Security for the Bonds: A statement that the bonds are payable solely from the revenues derived from the operation of the electric system and do not constitute general obligations of the City.

Behind Our Air Power And The SAGE System



7 Enterprise DSQ-38 Turbocharged Diesels provide completely independent power at "joint center" SAGE system power plant, McChord AFB, Wash.

...Electric Power by ENTERPRISE

This is one of the vital SAGE* system plants powered by Enterprise. In all, 25 Enterprise Engines provide some 44,000 HP, or 31,000 KW of power required to operate four of the complex SAGE network centers.

SAGE is the giant cyclops eye that will survey the skies far beyond our borders in a continuous search for aerial invaders. It's automatic. Electronic equipment can assemble and correlate information on air activity from a vast number of sources, describe the air situation, and direct interceptor aircraft and pilotless missiles to the target—all in a matter of seconds.

The need for totally dependable, uninterruptable

electric power to operate computing and other equipment is obvious. Without it, SAGE just couldn't function. Our air defense system would be useless. That's why Enterprise Engines, both straight diesel and dual fuel types, have been installed in many of these critical centers. They meet rigid Air Force requirements—rewarding testimony to their real value.

No power plant should settle for less than Enterprise quality, long the choice of power experts. Get full information on models from 73 to 7703 HP in diesel, dual fuel, tri-fuel and spark ignited gas engines.

*Semi-Automatic Ground Environment



DEPENDABLE ENGINES

ENTERPRISE
engine & machinery co.

Subsidiary of General Metals Corporation
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EBMI
Underground Boring
Machine
New! Improved!



Model 70

- **BORES**—with no surface break
- **BORES**—up to 250 feet in length
- **BORES**—up to six inches diameter
- **BORES**—so drill stem of pipe of conduit stays
- **BORES**—1,000 feet on 1 Gal. of gas
- **REAMS**—up to 12 inches diameter

Write immediately for information.

EBMI
EARTHWORK BORING MACHINE, INC.

P. O. Box 1100
 Santa Monica, California

*When this Nameplate
 goes into place . . .*



YOU KNOW
YOU HAVE
the Best



640 COLUMBIA AVE.
DARBY, PA.

(7) Description of the City government, Board of Public Utilities, etc.

(8) General information concerning the City; population, climate, agricultural and industrial facilities, transportation facilities, assessed valuation of tangible property located in the City, and similar information.

(9) Description of the Electric System:

(a) Generating stations—location, capacities and ratings of generating units.

(b) Substations—number of transmissions, distribution and customer substations and tabulation of number and ratings of substation transformers.

(c) Transmission lines—voltages, number of miles and types of construction.

(d) Distribution lines—miles of pole line, miles of wire, miles of conduit bank, miles of cable, etc.

(e) Line transformers—list of individual ratings and number of distribution transformers in service and in stock.

(f) Meters—number of electric meters in service and in stock.

(g) General property—description of office buildings, rural sales offices, warehouses, storerooms, automotive equipment, storage yards and other properties.

(10) Power Supply: Description of sources and capability of sources of power available from generating stations and system interconnections.

(11) Results of Operations: Data on energy sales, revenues, expenses and net earnings during the past three or more years of operations.

(12) Coverage of Maximum Debt Service Requirements: Statement of ratio of average of past annual net operating revenues to maximum principal and interest requirements in any subsequent year on all bonds outstanding, including the issue covered by the prospectus.

In general, the determination of the average of past annual net operating revenues should be based on data pertinent to the three operating years ended next preceding the issuance of the new revenue bonds. Such net revenue is after deduction of the expenses of operation, maintenance, and repair of the system, including taxes, but before depreciation, amortization and interest chargeable to income account.

A typical example of bond coverage requires: (1) That the average annual net operating revenue shall

have been at least twice the maximum interest charges that will become due in any year thereafter on all obligations of the City after the issuance of the proposed additional obligations; and (2) that the average annual net operating revenue shall have been equal to at least 135 percent of the maximum amount to be paid out in any subsequent year for principal and interest payments.

(13) Accountant's Certificate: Statements by certified accountants regarding the utility's assets, liabilities, income and accumulated net earnings. Also, statement of average annual net operating revenues for determination of bond coverage.

(14) Summary of Covenants and Ordinances by Municipality: Including principal requirements of City ordinances and resolutions with regard to establishment of various operating funds, system operating and maintenance policies for the utility, etc.

(15) Statement regarding tax status on interest on the bonds.

(16) Statement Regarding Issuance of Additional Revenue Bonds: The prospectus should contain language to the effect that the City shall have the right to issue subsequent revenue bonds, in the future, at parity (and not subordinate) to the proposed issue, provided debt service coverage and payments are maintained in accordance with the stipulations of the coverage clauses.

Depending on the size and importance of the bond issue, the prospectus sometimes contains photographs and descriptive information regarding the City, such as schools, industries, transportation facilities and other matters. In addition, the prospectus often includes sinking fund tables for the proposed bond issue (with interest computed at some assumed rate), existing rate schedules, and estimates of future revenues and expenses throughout the period covered by the bond maturity schedules.

The factual information, the arrangement, and the completeness with which a revenue bond prospectus is edited has a considerable bearing on the attraction of prospective bond purchasers. Considering the economic effect of bond interest rates on subsequent system operations, a well documented prospectus should be prepared for all bond issues so as to realize the lowest possible interest rates for the utility at the time and place in which the bonds are sold.



How a John Deere Loader kept this job on schedule for Denver Mountain Parks

As part of an over-all improvement at Denver's famous Red Rocks natural amphitheatre, plans called for a very narrow inclined pedestrian tunnel to be cut through 100 feet of red Colorado sandstone, directly under the front rows of seats.

After an attempt with pick-and-shovel labor, a John Deere "440" Diesel Crawler-Loader was put on the job.

D. R. Dickerson, superintendent, reported, "Thirty minutes work with this loader accomplished as much work as four men could do in four hours. We have found the unit

performs well in removing loose stone at the forward wall, in cutting clean sidewalls, and even in cutting down the sandstone overhead.

"For this tight schedule tunnel job, we especially like the unit's combination of size and power. When we are not using the loader in the tunnel we put it to work on general cleanup, where its compact size permits use in confined areas."

Get the impressive facts on the "440" Crawler-Loader first hand. See your John Deere Industrial Dealer for a demonstration, plus details on the John Deere Credit Plan.

John Deere Industrial Division, Dept. 1933, Moline, Illinois.

JOHN DEERE



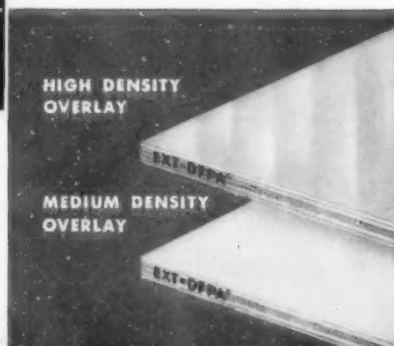
"Specialists in Low-Cost Power with a Heavyweight Punch"

Idaho cuts maintenance with quality signs

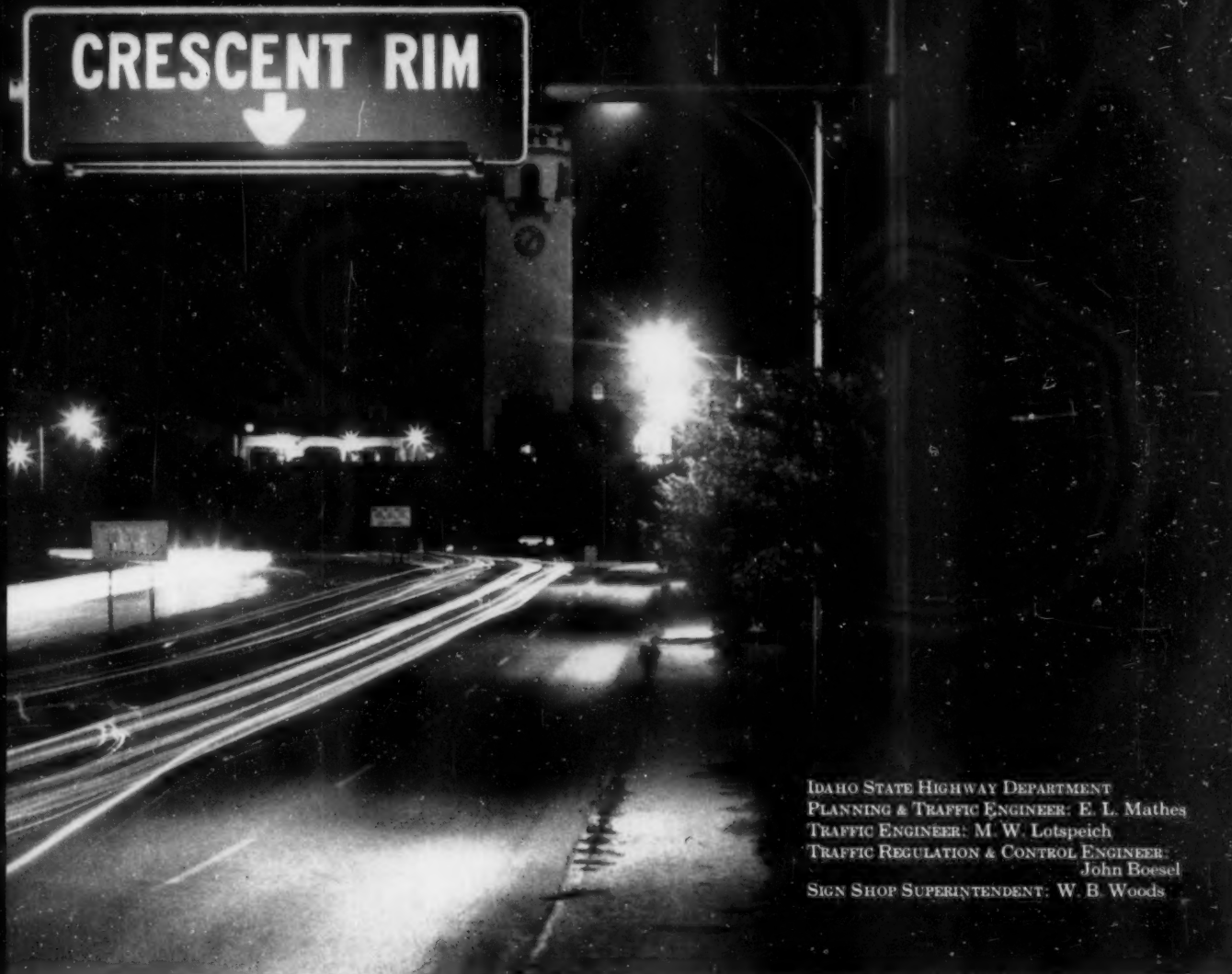


On standard black-background informational signs, reflective letters are applied directly to black High Density overlaid plywood, eliminating painting.

High Density overlaid plywood needs no protective painting; color (black, brown or amber) is in the overlay. Medium Density is for plain painted signs. Base panel is waterproof Exterior plywood.



and replacement costs of overlaid fir plywood



IDAHO STATE HIGHWAY DEPARTMENT
PLANNING & TRAFFIC ENGINEER: E. L. Mathes
TRAFFIC ENGINEER: M. W. Lotspeich
TRAFFIC REGULATION & CONTROL ENGINEER:
John Boesel
SIGN SHOP SUPERINTENDENT: W. B. Woods

Illuminated for maximum night-time legibility this overhead installation is prime example of Idaho's efficient signing system.

OVER 7,000 MODERN OVERLAID PLYWOOD SIGNS of every type and size help make motoring a pleasure on Idaho's scenic highways. They also help the state highway department do a better signing job at considerable savings to taxpayers.

Until 1953, when Idaho switched to High Density overlaid plywood, maintenance and repair had been a constant problem. Weathering is unusually severe; temperature ranges from 115° above to 40° below zero. Vandalism damage from hunters in isolated areas and resultant progressive deterioration were particularly troublesome. Under these rugged conditions, overlaid

plywood has performed consistently well—particularly in areas where signs are subjected to unusual abuse. As a result, maintenance costs have dropped sharply.

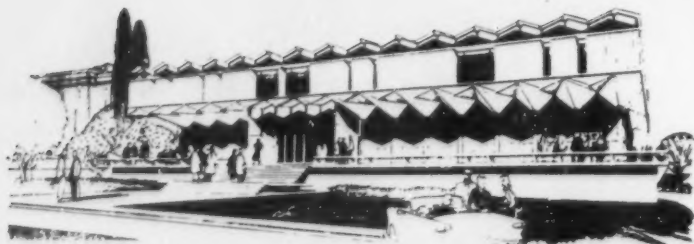
Initial fabrication and installation costs are also less. Records at the Idaho sign shop in Boise show a completed overlaid plywood sign costs between 10 and 15 percent less than aluminum.

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

—a non-profit industry organization devoted to research, promotion and quality control





STEINBERG MEMORIAL

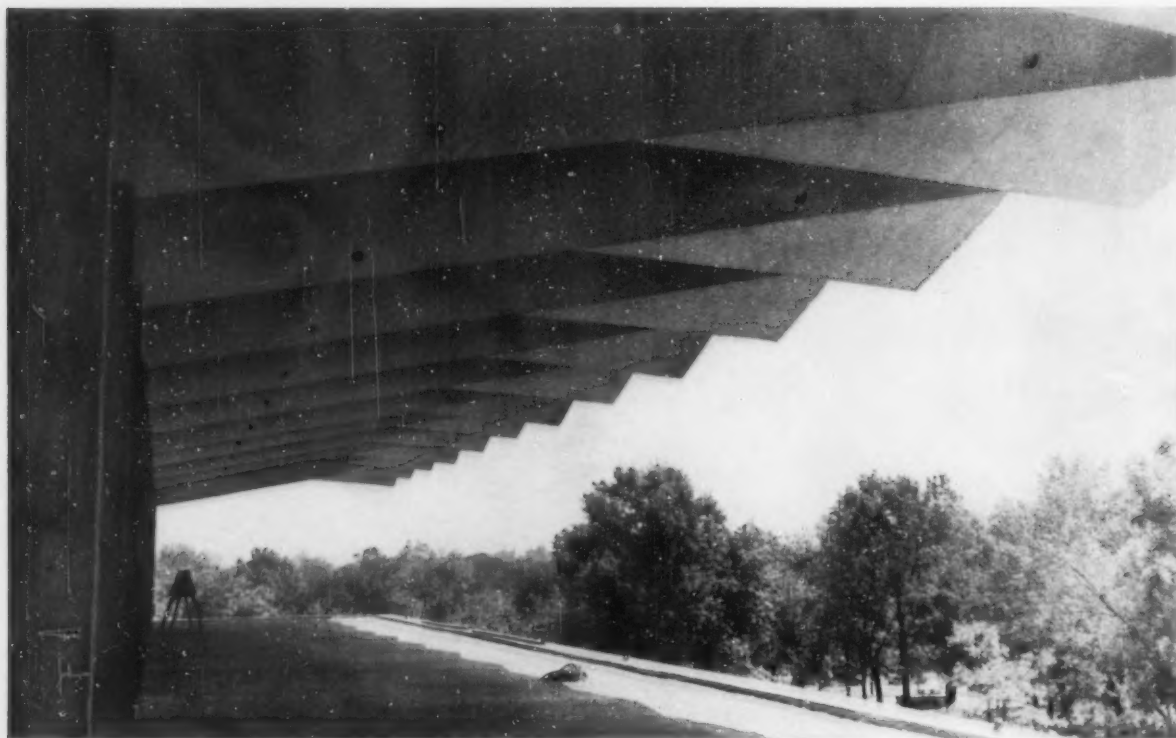
*Hall of Art and Archaeology
Washington University, St. Louis*

General Contractor: G. L. Tarlton Contracting Co.

Architect: Russell, Mullgardt,

Schwartz and Van Hoefen

Structural Engineers: Eason, Thompson Associates



An Interesting use of Concrete... STRENGTHENED with LACLEDE REINFORCING STEELS

In today's bold new architecture, concrete has become a medium of artistic expression, rather than a mere structural material.

This dramatic building by Russell, Mullgardt, Schwartz and Van Hoefen is a superb example. Intersecting concrete planes form an interesting pattern of shades and shadows against the severe vertical lines of the limestone walls.

Notice the 20-foot overhang in the photograph. Design like this would be impossible without the inherent strength of concrete, reinforced with specially designed high-strength steels.

In Steinberg Memorial, this strength is provided by Laclede reinforcing steels.

Laclede reinforcement is finding its way into more and more concrete structures these days—buildings, highways, bridges, grain elevators and many others. It's the ideal material for providing the strength needed for durability and long-lasting service.



LACLEDE

LACLEDE STEEL COMPANY

SAINT LOUIS, MISSOURI



Producers of Steel for Industry and Construction

● **WEED-FREE** guard rails on the Connecticut Turnpike as a result of treatment two years ago with a herbicide and bitumen cap. Mr. Wright in foreground looks at results of work.



HOW CONNECTICUT REDUCES GUARD RAIL WEEDING COSTS

"75 percent of roadside vegetation control will be done chemically in five years."

—William C. Greene, Landscape Engineer,
Connecticut State Highway Department

"And these chemicals will be of four types—sterilants, growth inhibitors, and selective and non-selective herbicides."

—John L. Wright, Engineer of Roadside Development,
Connecticut State Highway Department

AMONG the pioneers in the use of chemicals for low-cost control of weeds and vegetation is the Connecticut State Highway Department, which has a progressive program for testing new chemicals as well as new ideas. William C. Greene, Landscape Engineer, and John L. Wright, Engineer of Roadside Development, have been in charge of much of this work, which has resulted in procedures that have been widely adopted by other states. Their latest developments include a new way to control weeds and grasses around guard rails.

Connecticut has 2,000 miles of guard rails—more than many much larger states because of a strict law which makes guard rails mandatory at any embankment steeper than 4:1. The high cost of weeding and mowing around a million posts was a strong incentive for Greene and Wright to try some new methods. They tested soil sterilizers, growth inhibitors, asphalt layers, herbicides. Now, after five years of testing,

they have settled on a herbicide and a bitumen cover which have given excellent results. Here's how this program works.

Herbicide Applied First

The Connecticut guard rail weed control program can be followed on any day of the year as long as it is not raining and the ground is unfrozen.

The first step is applying a herbicide, such as Simazine, along the guard rails. Since Simazine does not kill growth on contact, a pre-emergence application in the fall, winter, or spring is preferred since the ground is bare of vegetation at that time. Simazine, a product of Geigy Chemical Corp., acts mainly through the roots and has residual action, making it effective long after being sprayed. At other times of the year (late spring or summer), amino triazole is added to the spray to kill existing growth. Amino triazole is a development of Amchem Products, Inc.

According to Bill Greene, Simazine herbicide is excellent because it is easy to apply, stays well in suspension in the tank, does not cause irritation, is effective, and is economical. Another important feature is that it does not leach laterally from under the bitumen cover. Such leaching could cause bare areas, especially on the embankments, which eventually would erode into gullies.

Ten pounds of the 50% wettable powder are mixed with 50 gallons of water, which is sufficient for an 18-in. strip under two miles of guard rails. 50-gallon drums are used as tanks and are mounted on a truck. So is a four-gallon Bean pump which is set at 50-60 pounds pressure. The nozzle is mounted on the right side of the truck, and it is fitted with two OC-20 tips which cover the ground all around the posts. Two gallons are sprayed per minute. The truck travels at 4-5 m.p.h. The application is controlled from the cab, and special care is

taken to apply the herbicide in an 18-in. band spaced one foot in front of the posts towards the highway and six inches behind the posts.

Immediately after this herbicide spray is applied, a bitumen cap is added to form a protective cover over the herbicide and to prevent erosion. MC-3 or RC-4 grade bitumen is used, at the rate of 0.4 gallon per square yard. This material is applied in a band 24 inches wide, as compared to 18 inches for the Simazine, thus providing a 6-in. overlap on the down-slope side beyond the strip treated with Simazine. This assures a perfect cover for the herbicide. During application, care is taken to protect white posts from the bitumen.

Large Savings Each Mile

This may seem like an expensive project, but not so according to John Wright: "Our total cost of applying Simazine and bitumen is \$45 per mile. This is relatively inexpensive when you figure that it normally costs us \$50 to mow such a mile-long guard rail strip two feet wide—and we'd have to mow three times per year." In other words, the mowing would cost \$150 a year, and would of course have to be done again each year. The herbicide-bitumen has to be done just once, and Wright figures it should last at least five years. That means a considerable saving for each mile. Multiply this by 2,000 miles, and it's easy to see that experimenting and then adapting new ideas really pays off for the Connecticut Highway Department.



● MR. GREENE checks multiflora rose beds that have been chemically treated. Grass line shows no lateral leaching.

Kill Weeds In Rose Bed

In his never-ending search for doing things better and cheaper, Bill Greene recently ran a test on controlling weeds in beds of multiflora roses planted along the median strip on Interstate route 91. At the suggestion of Roy Johnson, Amchem Products, Inc., he mixed 2 pounds Amino Triazole 50W with 6 pounds Simazine 50W in 100 gallons of water. This was sprayed on the rose-beds at the rate of 100 gallons per acre. Application was made with the same basic equipment as for the guard rails, except that a hand boom and extension was used to apply the spray low around the plants. A No. 6504 T-jet nozzle was used. Results were phenomenal. The Amino Triazole provided the initial weed knockdown, and Simazine herbicide provided the residual effect. Within two weeks, weeds and grasses were dead, and new weed growth did not occur all summer. There was very slight temporary injury to some hawthorn which were in the beds, not enough to do any serious damage. There wasn't any leaching, so that the edges of the beds remained straight and neat.

Results of these tests have been so successful that all 7 to 8 miles of such multiflora rose beds are now being treated this way. Bill Greene expects to add wood chips around the roses to a depth of 4 inches after the treatment, "to provide a mulch and hold in the moisture." (See "Maintenance of Roadside Development Plantings on the Connecticut Turnpike, PUBLIC WORKS, November,

1958.) When compared to the old laborious hand weeding of shrub beds, this new program is another real breakthrough in reduction of maintenance costs.

Tests are continuing. Wright and Greene are now trying to determine if the mixture used so successfully around multiflora roses will work around other shrubbery as well. They are also applying a weak solution of Simazine on top of wood chips around plantings, to see if this will completely halt weed development. They are already eyeing some of the newer chemicals, such as Atrazine, a Geigy herbicide. At all times, they are searching for ways to:

Lower costs, especially by using chemicals.

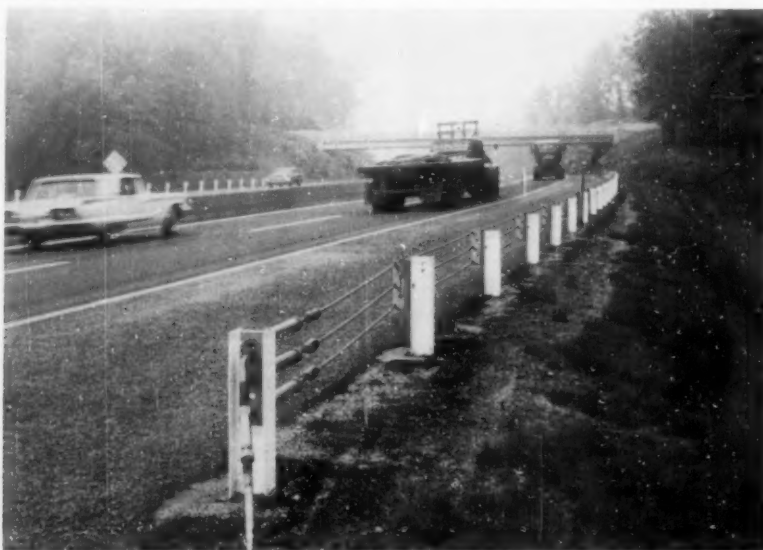
Promote health, by reducing pollen-producing weeds.

Increase safety, by eliminating weeds and grasses which cover up signs.

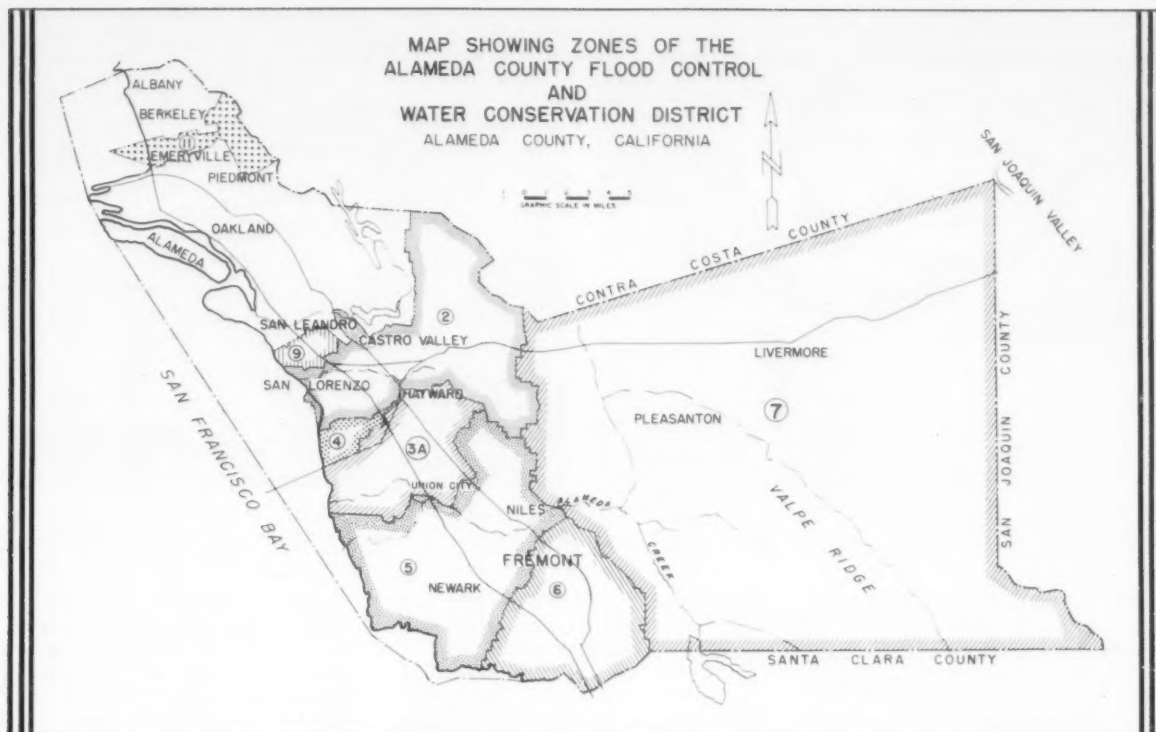
Improve drainage, by removing weeds which obstruct drainage along roads.

Encourage sanitation, by making guard rails and highways look neat and clean.

By first thoroughly testing and then using chemicals, the Connecticut State Highway Department is slowly overcoming high labor costs. Connecticut's progressive method of letting chemicals do the work is helping to bring the day closer when "75% of the roadside vegetation will be controlled chemically."



● ANOTHER view showing how growth is controlled around guard rails on the Connecticut Turnpike. A non-selective herbicide, followed by a "cap" of bitumen, was applied two years before this picture was taken. Saving is substantial.



Coordinating FLOOD CONTROL and STORM DRAINAGE for COUNTY ROADS and CITY STREETS

HERBERT G. CROWLE,
Director of Public Works,
Alameda County,
Oakland, California

THE NECESSITY for co-ordinated planning and construction of highways and streets under the jurisdiction of various agencies of local government has become generally accepted in recent years. One essential element in this co-ordinated program, namely flood protection and storm drainage, presents many difficult problems and warrants special consideration.

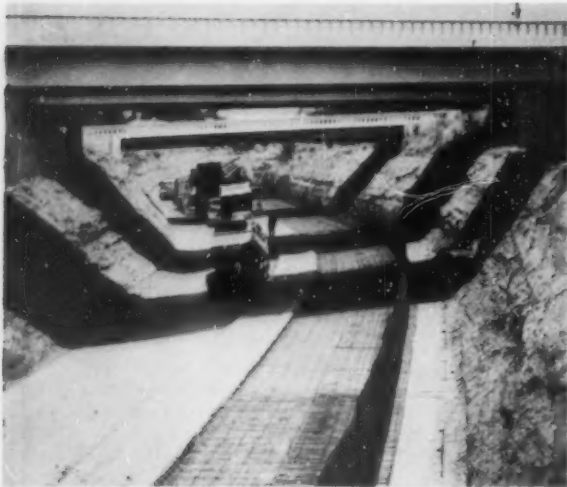
Typically, the modern-day metropolitan area consists of a number of separate cities adjoining each other or separated by unincorporated areas under the jurisdiction of the County. The unincorporated areas may be urbanized or rural or in some stage of transition. The continuing construction of highways, streets, buildings and other impervious surfaces results in augmenting, accelerating,

collecting and concentrating the storm-water runoff, with inevitable alteration in the natural drainage conditions.

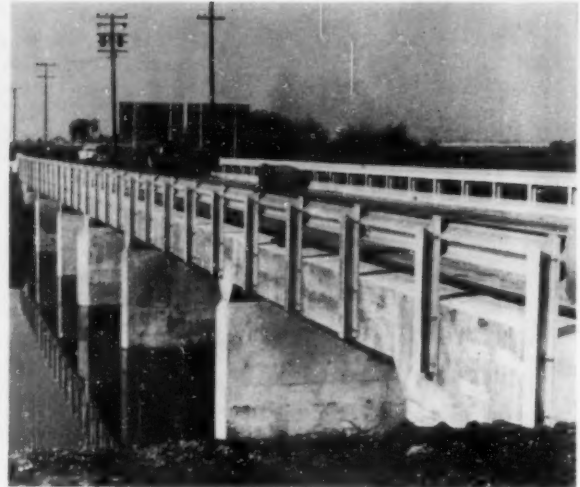
In the early stages of urban development, the resultant flood and drainage problems may not be too serious and it is difficult to recognize the magnitude of the problem that is developing. Then, during a period of heavy rains, streets are flooded, transportation is interrupted, private properties are damaged, and there may even be loss of life. The damage usually occurs several times before full recognition of the problem is reached and a solution is developed. The earlier that this recognition comes, the greater are the potential economies that may be realized through adequate planning and construction of the necessary hydraulic facilities.

The streets and highways bear a special relationship to the storm water runoff because of the way we normally build our urban areas,

in this respect: the private properties are normally graded to drain to the adjoining public streets. The streets contain gutters to collect and concentrate the storm water, and thereby become the initial elements in a storm-drainage system. The governmental agency which owns the streets thus acquires, often unwillingly and unwittingly, the responsibility for safe disposal of the waters collected therein. Road funds are seldom adequate to finance construction of a comprehensive system of storm drains and flood-control channels, and in many localities there are legal restrictions on such use of road funds to any extent exceeding the minimum facilities required for protection of the streets. It is especially difficult to utilize road funds for facilities outside the road rights-of-way. This can result in conflicts between adjoining governmental jurisdictions, or between the local government and private property owners.



● THE THREE bridges crossing this Federal Flood control project were built previously but conform to the overall plan.



● BRIDGE over flood control channel near Hayward was financed jointly from road funds and flood control money.

The detrimental effects of flooding and poor drainage on highways and streets and appurtenant facilities are important from the standpoint of both economy and safety; some of these effects may be listed as follows:

- 1). Failures in subgrade or pavement caused by poor drainage, with resulting need for costly repairs and high maintenance costs.
- 2). Interruption and delays of traffic caused by flood conditions or pavement failures.
- 3). Hazards to vehicles and persons caused by flood conditions or pavement failures.
- 4). Damage to culverts and bridges resulting from hydraulically inadequate structures.
- 5). Damages to public and private properties from flooding.
- 6). Interruption of utilities and communications systems.
- 7). Infiltration of flood waters into water supply and sewerage systems, resulting in a menace to public health.

From the above discussion, it is evident that the streets and highways are a part of the problem, that is, they contribute to it, and at the same time they suffer important ill effects from it. Yet, it is often not feasible for any one jurisdiction to achieve a comprehensive solution, even for its own facilities. Under these circumstances, it is necessary to obtain a high degree of co-operation among the governmental jurisdictions and provide a systematic and equitable means for carrying on such co-operation.

In Alameda County, California,

the various jurisdictions have developed a highly successful and growing system for co-operation in the field of flood control and storm drainage for streets and highways. The principal elements utilized in this program have been a county-wide flood control district and intelligent understanding and desire to co-operate on the part of the local governmental officials. A brief description of the area and the development of this program follows.

Alameda County is situated on the east side of San Francisco Bay. It has an area of 843 square miles and a population in excess of 900,000. Topographically, the County

consists of a shoreline of some 40 miles on San Francisco Bay; an alluvial plain, 2 miles wide at the northern end and 8 miles wide at the southern end, lying between the Bay and the base of a rugged range of hills which run generally parallel to the Bay shoreline, that is, in a generally northwest-southeast direction; east of the first range of hills is the Livermore-Pleasanton Valley, surrounded by mountains up to 3,850 feet in elevation. Most of the area of the County slopes and drains westerly toward the Bay. There are thirteen incorporated cities: Albany, Berkeley, Emeryville, Piedmont, Alameda, Oakland,



● BY CO-ORDINATING the installation of this major storm drain system with a street improvement project in Hayward, Calif., substantial savings were realized.

San Leandro, Hayward, Union City, Fremont, Newark, Pleasanton and Livermore and two major unincorporated urban communities: San Lorenzo and Castro Valley. The largest city is Oakland, with a population of 400,000. Until the end of World War II, substantially all of the urban development had occurred in the northwestern sector of the county, north of San Leandro. The postwar years have seen rapid growth in the entire county, with a progressively greater proportion occurring in the central, southern and eastern sectors.

Flood Control District

The Alameda County Flood Control and Water Conservation District, with boundaries coinciding with those of the County, and having the County Board of Supervisors as the governing body, was created by the State Legislature in 1949 and was activated in January 1950. The District has a legal tax limit of 1½ cents per \$100 of assessed valuation, the revenue from which may be used for general administration and planning. Financing for the construction and maintenance of flood-control and storm-drainage improvements is accomplished through the creation of zones of the District. The District has broad powers for cooperation with Federal, State and local governmental agencies, utilities and others.

Personnel of the Alameda County Flood Control and Water Conservation District constitute a division of the Alameda County Public Works Department, under the jurisdiction of the writer.

The Flood Control District has held many public meetings to obtain testimony from property owners and representatives of governmental agencies regarding flood and drainage problems. The public meetings have been followed up by engineering surveys to determine the location and extent of the problems.

A comprehensive master plan of flood control and storm drainage has been substantially completed for most of the area of the County. Based on this master plan, a number of zones have been established, with boundaries usually following watershed lines, but in some instances dividing the watersheds into separable and distinct problem areas. Flood-control and storm-drainage improvement projects have been instituted for six of the zones to date, under the proceedings prescribed in the State laws governing the District. In five of these six zones, the voters have approved, by the neces-

sary two-thirds majorities, bond issues for the capital improvements in the zone projects; and in the sixth zone (Zone No. 9), the improvements are being financed on pay-as-you-go bases with revenue from an annual assessment levied on all real property in the zone. Financial provisions for maintenance and operation, based on annual assessments, are included in each of the zone projects as they are activated. Authorized zone projects approved to date, including a \$7,000,000 Federal flood control project on San Lorenzo Creek, total \$30,000,000 in estimated cost.

The Board of Supervisors has set a ceiling of 50 cents per \$100 assessed valuation on the zone assessment rates in five of the six active zones; in the other (Zone No. 4), the Board has set the ceiling rate at \$1, but the current rate is 72 cents.

Special mention should be made here of the City of Oakland, which developed its own master plan of storm drainage 30 years ago. The master plan has been used most effectively by the City over the years and it has resulted in an ex-

the creation of a zone or zones covering the watershed of San Leandro Creek, located along the boundary between Oakland and San Leandro, and including portions of the two cities and a large, undeveloped, unincorporated area easterly of the two cities. Both Temescal and San Leandro creeks represent problems involving two or more jurisdictions and are therefore the kind of problems in which the Flood Control District can be utilized to great advantage. The zone improvement projects will be worked out in close co-operation with the cities involved.

Flood Control District Master Plans

In the active zones south of Oakland, namely, Zones Nos. 2, 3A, 4, 5, 6 and 9, the flood-control and storm-drainage master plans developed six to seven years ago have been utilized with remarkable success in connection with the design and construction of State highways and freeways, county roads, and city streets, with resultant economies of millions of dollars in costs to the taxpayers



● CHANNEL realignment extending 0.5 mile upstream from wall on right of photograph provided more area for nearby school and more economical flood control.

cellent drainage system and substantial economies for the city taxpayers. Recently, the Oakland City Council requested the Flood Control District to establish a zone covering the watershed of Temescal Creek, which includes part of north Oakland and a large portion of Emeryville (Zone No. 11). Consideration is also being given to

and in flood damages prevented. The economies have resulted from the following: Real estate developers have been able to install at their expense the complete and final drainage facilities required within the boundaries of their developments at little or no expense to the general taxpayers; good drainage has resulted in good quality



● **DROP STRUCTURE** and larger and deeper channel was constructed to solve a serious siltation problem at this point.



● **DESILTING** basin was financed jointly by the Flood Control District, State Div. of Highways and City of Fremont.

streets with low maintenance costs; the new freeways have been constructed by the State with all culverts, bridges and storm drains conforming to the master plan of flood control and storm drainage, often under co-operative projects with the local agencies; city and county street improvements have included drainage facilities conforming to the master plan.

Examples of co-operative projects undertaken by agencies of government, utilities and private developers are described below in order to illustrate the methods of co-operation utilized in Alameda County in the fields of flood control and storm drainage, all involving the Flood Control District as the vehicle or as an essential participant.

In 1954, the Congress of the United States authorized a Federal flood control project on San Lorenzo Creek in Alameda County, based upon plans developed by the U. S. Corps of Engineers. The County Flood Control District immediately adopted the proposed Federal project as a part of its master plan and proceeded to construct during the Fall of 1954 a badly needed improvement of the lower reaches of the stream. This improvement, which cost \$400,000, was financed entirely with local funds raised by Zone No. 2 of the Flood Control District, and conformed to the preliminary plans then available from the Corps of Engineers for the authorized Federal project. In the disastrous floods in northern California in December, 1955, and April, 1958, this \$400,000 improvement paid off twenty-fold, preventing flood damages of \$8,000,000 and possible loss of life. The Corps of Engineers provided important assistance in making emergency repairs to the creek channel after each of these floods. The Federal flood-control project on San Lor-

enzo Creek, which had been authorized in 1954, finally got under construction in April, 1959, and is presently about half completed; it will cost approximately \$7,000,000.

During the 8-year period preceding the start of construction of the Federal project, the County road department built two bridges and the State Division of Highways built four bridges over San Lorenzo Creek. All of these were co-ordinated by the Flood Control District and were made to conform to the requirements of the Federal flood-control project. It is therefore not necessary to make any expensive modifications of these six bridges.

Co-Operation With State Division of Highways. The California State Division of Highways, recognized as one of the most outstanding highway organizations in the nation, has very wisely adopted a policy of close co-operation with local agencies. In Alameda County, this policy has worked particularly well, and to the mutual advantage of the State and the local agencies. Since the activation of the Alameda County Flood Control and Water Conservation District in 1950, the State, in its construction of freeways and improvements of State Highways, has installed bridges and culverts to conform to the master plan of flood control and storm drainage. The Flood Control District has performed its part by acquiring rights-of-way across private properties and constructing channels and pipelines to convey the storm waters to, through and away from the bridges and culverts on the freeways and highways. In many instances, in which there is no distinct physical separation of jointly needed facilities, the State and the District have entered into written co-operative agreements to finance and construct hydraulic facilities of mutual benefit. Each of

these written agreements provides for an equitable allocation of the capital cost between State and District and assigns responsibility for maintenance of the various facilities.

Those who have had the experience of paying for installation of drainage facilities or utilities in or under a completed freeway or turnpike with traffic on it know the great economy of installing such facilities at the time of construction of the highway.

Co-Operation With County Road Department. Since both are under the jurisdiction of the same governing body, the cooperation between the Alameda County Flood Control District and the County Road Department has been very close. Each reviews the other's plans, and the Flood Control District performs or checks the hydraulic design of the drainage facilities proposed in County road projects. Co-operative agreements for joint financing and construction of drainage facilities are very common and result in substantial savings to both agencies. This means that the taxpayers receive more for their tax dollars by getting facilities installed which will not need expensive modification or replacement at a later date.

In the construction of new County roads or the reconstruction of existing ones, the County Road Department normally constructs with its own funds any bridges or culverts required over existing waterways. In such cases, the Flood Control District ordinarily finances any necessary improvement of the waterway across private property upstream and downstream from the County road right-of-way and performs such improvement either concurrently with or shortly after the road construction, so that the facilities will be completely functional as soon as practicable.

Cooperation With Cities. As stated above, the revenue for Zone No. 9 is obtained by annual assessments on all real property in the zone. This revenue is collected with taxes and half of it for any one year becomes available on January 1, after the December tax collection, and the remaining half on May 1, after the April collection. The fiscal year starts on July 1, and there are no substantial revenue receipts available for expenditure for six months, until January 1. The heavy rains in this part of California occur during the six months from November through April. In June, 1958, it was evident that a badly-needed storm-drainage facility in the rapidly growing industrial section of the City of San Leandro could not be constructed by the Flood Control District (Zone No. 9) prior to the winter rains because of insufficient funds available prior to January 1, 1959, although the zone revenues to be received after that date would be sufficient to permit construction in the spring of 1959. Failure to get the storm drain constructed prior to the winter rains beginning in November, 1958, could result in serious damage to some of the new industries. Accordingly, the City of San Leandro entered into an agreement with the Flood Control District providing for the City to advance \$80,000 to Zone No. 9 in July, 1958, so as to bring the available zone funds up to the amount required to construct the storm drain before the winter rains, and for the District to refund the loan to the City by the end of the fiscal year in June, 1959. The work was successfully accomplished in time to prevent flood damage.

Another proposed agreement affecting the City of San Leandro involves five parties: the City, the Flood Control District, the State Division of Highways, the Oro Loma Sanitary District, and the developer of the Bayo Vista subdivision. Further development of the subdivision, which is located on a hill, has been stopped until provision has been made for the safe disposal of storm water runoff through downstream areas. The most economical solution is the construction of a 4-ft. diameter storm-drainage pipeline in the right-of-way of MacArthur Boulevard, a State Highway (U. S. 50), which is proposed to be reconstructed into a freeway. The Oro Loma Sanitary District has offered to contribute funds which it had collected on an acreage assessment of new developments for drainage

facilities previously installed in this area by the Sanitary District. The City will realize benefits from the project and the Flood Control District has authorized funds of Zone No. 2, in which the storm water runoff originates. Successful accomplishment of this project will represent an outstanding achievement in voluntary co-operation.

The City of Hayward in 1958 set up a special assessment district to improve streets and install curbs, gutters and sidewalks in an older section of the city, at a cost of \$600,000. The Flood Control District had previously authorized the construction of a storm-drainage system in the area, but the system had not been constructed. By co-operative agreement, the installation of the storm drains by the Flood Control District and the street improvements by the City were co-ordinated, with substantial benefits to both parties.

Also in 1958, the City of Fremont joined with the Flood Control District and the State Division of Highways in financing construction of a desilting basin in a stream which came out of steep hills and had previously caused continual silting-up of a State Highway culvert and a City storm drain, resulting in extremely high maintenance costs.

Cooperation With Railroads and Utilities. Providing proper drainage for county roads and city streets requires working with railroads and utilities, also. The Flood Control District is required by law to pay the cost of necessary modifications of railroads and utilities. Many such modifications have proved necessary, including such items as railroad bridges and trestles, power transmission lines, major gas lines, co-axial telephone cables, sewer trunk lines, and water transmission lines. In recent years, all interested parties: the State, the County, the cities, districts, and utilities have developed a system of co-ordination of planning and design to eliminate conflicts of facilities. This is now beginning to pay off in savings to all concerned.

In some instances in which the railroad company wishes to make an improvement of a bridge or trestle at the time the Flood Control District is constructing a drainage facility through its right-of-way, the company has entered into a co-operative agreement to contribute funds to the District for concurrent construction of the improvement.

Cooperation With Developers and Property Owners. The term "developer" is applied in California to one who develops land into residential, commercial or industrial tracts. The developers construct streets to serve their developments and these streets are turned over to the County or the City, as the case may be, for maintenance. In Alameda County, each developer is required to install the drainage facilities within or on the boundaries of his tract needed to provide for drainage of his own development and for transporting safely through his tract the storm water runoff from higher lands under conditions of full urban development of such higher lands. In some instances in which an authorized Flood Control District facility passes through a proposed tract, the developer has entered into a co-operative agreement with the District for joint financing of drainage installations. This has resulted in economical construction for both parties. The Flood Control District strives to keep up with new developments by providing flood control and drainage facilities to serve them. Close liaison is maintained with the cities in which the developments are located to determine priorities for construction of the various facilities.

A number of private property owners have contributed funds to the Flood Control District to pay the cost of modifying a proposed District project to provide an improvement desired by the property owner. Changing a proposed or existing open channel into a closed conduit is a common type of modification.

In reviewing the reasons for the success in Alameda County of providing a comprehensive system of flood control and storm drainage for county roads and city streets, one cannot help recognizing that the voluntary co-operation among the public and private organizations involved is outstanding. Added to this is the existence of a county-wide Flood Control and Water Conservation District with sufficient authority to develop and promulgate the master plan and with sufficient flexibility to take care of the problems in close co-operation with the cities and other local agencies.

The writer wishes to acknowledge, with appreciation, the assistance of Frank Tremayne of the County Public Works Department staff in taking and compiling the photographs for this article.

SURVEY

Shows Present Status of Oxidation Ponds and Sewage Lagoons

DURING THE summer of 1959, a questionnaire was sent to all state sanitary engineers requesting information on the extent of use of oxidation or stabilization ponds and sewage lagoons and on the requirements imposed by the various states in respect to design. Replies were received from 48 states, some of which do not have any installations of this type. The reply from California is not included in the tabulation since this noted that "In California no approval is required of proposed treatment works, therefore we do not permit or prohibit. Requirements are given for effluents and/or receiving waters."

Number in Use

The first question was "Do you permit their use?" And this was followed by "how many cities in your state employ this method?"

Of the 47 states tabulated, 33 permit the use of such ponds or lagoons, 4 do not permit them and 10 have not yet adopted any definite policy. In all 652 cities were reported as using this method; in 8 other cities construction was under way; and there were 29 other installations reported, either as proposed, ready for construction or used by other than cities. Most prolific users are North Dakota, approximately 100; Texas 152 plus; and South Dakota 65.

Size and Preliminary Treatment

Most states, 28 of those using this method of treatment, do not have any community size limit above which approval will be withheld; 2 restrict sizes; and 3 others have various criteria: "usually less than 5,000"; "not over 2,500"; and "usually less than 1500." In another case location requirements control size. In general, it appears that a population of 5,000 to 10,000 is considered the upper limit, not so much because of any inadequacy of the process, but because of land area requirements and adjacent populations.

Very few states require preliminary treatment. In respect to screening, three require it but 29 do not.

One recommends screening or comminution while not requiring either, but another discourages any preliminary treatment. None requires comminution and 28 state definitely it is not required. Sedimentation is required by 2 and not required by 27; a degree of uncertainty appeared in the answers from 2 states.

BOD and Population Loadings

Loadings with raw sewage varied from 100 to 350 persons per surface acre and from 17 to 80 pounds of BOD. One state permits 350 persons per surface acre; 3, all southern, permit a loading of 300 persons; 6 permit 200 persons; 14 have a loading limit of 100 persons per surface acre; 5 others range between 100 and 200. The BOD loading range, based on 0.17 lb./capita, is essentially the same, with one at 60-80 pounds, one at 60 pounds, 3 at 50 pounds, 5 at 34-35 pounds, 7 between 20 and 30 pounds and 11 at 17-20 pounds.

For settled sewage, the same general range of loadings apply but only 11 states furnished population figures. Of these 8 permitted 150 or more persons per surface acre and 3 under 150. The BOD loading as furnished by 25 states showed 2 at 60-80 pounds, one at 60 pounds, 7 at 50 pounds, 8 at 20 to 35 pounds, and 7 at 17 to 20 pounds.

Pond Depth and Other Factors

Of 35 states indicating required depth, 25 were in the range of 3 to 5 feet. Others were close with 5 ft., maximum in all cases, and 2 to 5, 3 to 4 and 4 to 5 occasionally mentioned. One state required a 30 to 40-inch depth. Most states recommended a flexible arrangement, permitting variation in depth between a minimum of 3 and a maximum of 5 feet.

Chlorination of the effluent from lagoons or oxidation ponds appears to be required by only 3 states; 20 do not require chlorination; and 13 consider the particular conditions of each installation so that, in some cases, chlorination may be required.

Fencing is almost universally required—33 out of 35 states deem it

necessary; but there is variation in the type required. "Stocktight" fencing is required by 17; "hogwire" and/or "barbed wire" by 6; chain link by 4; and "it depends" by 6.

Comments by state sanitary engineers or their assistants follow.

Comments by Various States

New Mexico—In New Mexico we usually refer to ponds that receive settled sewage as "oxidation ponds". On the other hand, ponds that receive raw sewage are referred to as "lagoons".

We have made every effort to keep abreast of the developments in use of both oxidation ponds and lagoons. Oxidation ponds have been used considerably here in the Southwest since the end of World War II. In particular, we have numerous semi-public domestic sewage installations for private industrial communities that make use of oxidation ponds. These installations are not covered under the number listed on your enclosed form.

Our investigations indicate that a number of factors are usually overlooked. This includes the area of land necessary; availability of land in a proper location, cost of land; cost of pond construction and sealing of highly porous soils; weed and rodent control problems; mosquito and other vector control difficulties; and possible devaluation of large sections of property in the vicinity of the lagoons. In New Mexico we have found it impractical to use ponds of any type for communities larger than 10,000 in population. In fact, our vector control personnel are very much opposed to the extensive use of ponds, with particular opposition to raw sewage lagoons. Studies here in the Southwest have indicated that there is a tremendous increase in mosquito propagation in sewage ponds due to the increase in available food supply. A serious outbreak of infectious encephalitis during the summer of 1958 in this state emphasized the seriousness of this problem.

In summarizing our viewpoints, it might be stated that we are in favor

of both oxidation ponds and raw sewage lagoons on a limited scale for smaller installations, but we always have in mind the other factors involved as listed above. Hence, lagoons are not an overall solution to the sewage treatment problem, but they do have a definite place under the right conditions.

New York—In regard to the numbered questions in your letter:

1) We would permit sewage stabilization ponds if all the design criteria could be met. This design criteria is discussed in the revised "10 State Standards" which has not yet been released.

To date no community sewage systems use this method of treatment.

2) The size of the pond is self-limiting.

If adequate pond area and isolation distance could be obtained, there would be as far as we can see now no limit to the size of the community served.

3) We would not necessarily require any pretreatment if we felt the stabilization pond could produce the degree of treatment needed by the receiving stream.

4) (a) Raw sewage—100 persons per surface acre; 20# BOD per day per surface acre for year-round use. (b) Settled sewage; 20# BOD per day per surface acre based on settled sewage BOD.

5) [The required depth of the pond is] three to five feet; three foot minimum.

6) If a stream was classified or the proposed classification would be B or A, chlorination would be required.

7) Fencing is required. Because of the extreme cost of man-proof-fencing, we are considering requiring only a stock-proof fence.

I trust the above is helpful. As we learn more about the operation of stabilization ponds in this climate, we probably will change our present thinking. Whether the change will be toward more or less leniency only time will tell.

North Carolina—At the present time we have one experimental-type pond in operation at a state prison farm. If satisfactory results are obtained from this experiment, we

	Use Permitted	Number of Cities Using	Size Limit	PRELIMINARY TREATMENT REQUIREMENTS			RAW SEWAGE LOADING PER ACRE		TREATED SEWAGE LOADING PER ACRE		Depth, ft.	Chlorination	Fencing
				Screening	Comminution	Sedimentation	Persons	BOD, lbs.	Persons	BOD, lbs.			
Alabama	Yes	2	No	No	No	No	300	50	450	50	3-5	No	Yes
Arizona	Yes	10	No	No	No	No	300	50	400	50	3½-5	Sometimes	Yes
Arkansas	Yes	10	Yes	Yes	--	Yes	--	30	--	50	3-5	Sometimes	Yes
Colorado	Yes	29	No	No	No	No	100	--	--	50	3-5	No	Yes
Connecticut	No	(At least not as yet - we are too densely populated for one thing.)							--	--	--	--	--
Delaware	Not so far	--	--	--	--	--	--	--	--	--	--	--	--
Florida	No (Except after complete treatment.)	--	--	--	--	--	--	--	--	50	3-4	Yes	No
Georgia	Yes	None	No	No	No	No	200	35	--	--	3-5	Depends	Yes
Idaho	Yes	2	No	No	No	Depends	--	20-30	--	20-30	3-5	No	Yes
Illinois	Yes	17	No	No	No	No	120-150	20-25	180-230	20-25	3-5	Depends	Yes
Indiana	Yes	1	No	No	Desirable	No	100	20	130-140	--	2-5	Depends	Yes
Iowa	Yes	14	No	No	No	No	100	20	--	20	4-5	No	Yes
Kansas	Yes	14	No	No	No	No	--	25	--	25	3-5	No	Yes
Kentucky	Yes	None	No	---Not decided as yet---			----Standards not yet developed----				--	--	--
Louisiana	Yes	None	No	No	No	No	200	--	Not established		3-5	Depends	Yes
Maine	Possibly	None	--	--	--	--	--	--	--	--	--	--	--
Maryland	No specific requirement yet developed	--	--	--	--	--	--	--	--	--	--	--	--
Massachusetts	No design standards adopted	--	--	-- no such plants in use			--	--	--	--	--	--	--
Michigan	Yes	None	--	No	No	No	100	20	--	--	4-5	Depends	Yes
Minnesota	Yes	13	No	No	No	No	100	17-20	--	17-20	3-5	Depends	Yes
Mississippi	Yes	10	No	No	No	No	200	35	--	--	3-5	Depends	Yes
Missouri	Yes	--	No	No	No	No	200	34	--	34	3-5	No	Yes
Montana	Yes	38	No	No	No	No	200	18-20	Not recommended		5	No	Yes
Nebraska	Yes	34	No	No	No	No	150	25	--	25	3-5	No	Yes
Nevada	Yes	15	No	No	No	No	100	60-80	--	60-80	3-4½	Sometimes	Yes
New Hampshire	Yes	2	Yes	No	No	No	100	17	--	--	3-5	--	Yes
New Jersey	None approved as yet	--	--	--	--	--	--	--	--	--	--	--	--
New Mexico	Yes	6	?	No	No	No	100-200	17-34	400	50	2½-3½	Depends	Yes
New York	None approved as yet	--	--	-- 10 state standards will be used			--	--	--	--	--	--	--
N. Carolina	No	(Experimental unit now under trial.)			--	--	--	--	--	--	--	--	--
North Dakota	Yes	100	No	--This is discouraged--			--	20	--	20	3-5	No	Yes
Ohio	Not yet	1	--	No	No	No	162	27.8	--	--	3 min.	Not yet	Yes
Oklahoma	Yes	51	Yes	No	No	No	200	30	300	30	4	No	Yes
Oregon	Yes	6	No	No	No	No	100	20	150	20	2-5	Depends	Yes
Pennsylvania	Under trial	-- standards not yet developed.			--	--	--	--	--	--	--	--	--
Rhode Island	No requests received for approval.	--	--	--	--	--	--	--	--	--	--	--	--
S. Carolina	Yes	None	No	No	No	No	300	50	--	--	3-5	No	Freier
S. Dakota	Yes	65	No	No	No	No	100	15-20	100	15-20	3-5	No	Yes
Tennessee	Yes	3	Yes	No	No	No	100	17	no criteria		3-5	Depends	Yes
Texas	Yes	152	No	Yes	--	Yes	Not approved		--	50	3-4	No	No
Utah	No	None	--	--	--	--	--	--	--	--	--	--	--
Vermont	No requests received for approval	--	--	--	--	--	--	--	--	--	--	--	--
Virginia	Yes	None	No	No	No	No	150	30	no criteria		3-5	Generally	Yes
Washington	Yes	15	No	No	No	No	350	60	--	60	3-5	Yes	Yes
West Virginia	Yes	None	No	No	No	Sometimes	200	34	300	34	3-5	No	Yes
Wisconsin	Yes	5	No	Yes	Preferred	Sometimes	100	17-20	135	17-20	3-5	No	Yes
Wyoming	Yes	27	No	No	No	No	--	30	--	30	3-5	No	Yes

● TABULATION, as of mid-1959, shows for 47 states the number of cities using ponds and lagoons, plus design data.

probably will approve this type of treatment for small municipalities in certain areas of North Carolina.

The experiment covers a population of 1,000 persons. In addition to the domestic sewage contribution there are approximately 4,000 gallons a day of laundry waste and a seasonal load of 12,000 gallons a day of various canning wastes.

The pond is designed on a BOD loading of 35 pounds per acre per day necessitating a total of 16 acres of surface area. This area is divided into four ponds consisting of four acres each. The valves and piping connecting the four units have been arranged for flexibility of operation. The ponds may be operated in series or series-parallel fashion. The water depth is approximately 3½-4 ft. with inlets in the center of each pond and outlets at the side.

Even though design criteria have not been established, the above represents our thinking today; however, our criteria may be altered after the experimental pond has been in operation for a reasonable period of time.

Maine—In view of the fact that no cities or towns in the State of Maine have yet applied for or installed lagoons for treatment of domestic sewage, we lack information on the subject.

It may be of interest, however, to know that we have two industrial lagoons of this nature. In the Town of Livermore Falls we have a large storage lagoon for the storage of sulphite paper mill wastes, which is primarily a holding pond for storage of accumulations during low water flows in the summer, with release at periods of higher water in the fall after receding water temperatures in the Androscoggin River, which receives this drainage. In the Town of Dover-Foxcroft there is a substantial lagoon for treatment of tannery wastes which is a combination of settling lagoons, with overflow eventually into the Piscataquis River.

Maryland—It is impossible properly to answer the questions raised in your letter. We have no specific requirements for this type of sewage treatment device. At the present time we have one lagoon installed at a State park which handles a rather constant population, since it serves a prison camp in which the population is quite stable. Until we learn the efficiency of this lagoon during the current year we would not be in a position to suggest the design criteria which we will accept for

these devices. The existing lagoon was designed on the basis of the criteria used in North Dakota, which apparently is being more or less uniformly adopted by those states which permit the use of sewage lagoons.

So long as the distance requirements, used in the western areas, of one-half mile from the built-up area and one-quarter mile from the next house, prevail we do not believe many of this type of treatment plant could be constructed in the heavily urbanized areas of any of the eastern states.

Ohio—The village of Deshler, census population 1623 in 1950, protested the requirement of our Water Pollution Control Board that conventional sewage treatment works be installed at that community. Accordingly, at the 1957 session of the Ohio Legislature there was introduced a measure to make a state contribution of \$50,000 to the village of Deshler for the experimental construction and operation of a waste stabilization lagoon. The village is just about completing the construction of the works and will probably put it into service this summer.

A few figures about the Deshler design will amplify the information on your questionnaire, as follows. Deshler is located in the northwest part of Ohio in relatively flat country, on a drainage area of about 12 square miles which has relatively no flow in the summer and fall months. The village has combined sewers. The consulting engineers for the village estimated the design population at 1700 people, and an equivalent population of 2000 people for a poultry processing plant. Accordingly, the BOD load, computed at 0.17 lb. per capita per day, would be 289 for the village and 344 for the poultry processing plant, or a total of 633 to be handled by the works. Two lagoons were constructed, one of 13.2 acres, the other of 9.6 acres, or a total of 22.8 acres. The lagoon has a minimum depth of 3 ft. The engineer estimates that it would take 147 days for filling; or, in other words, the lagoons have a detention of that many days.

The project as nearing completion comprises a system of combined sewers, an intercepting sewer, pump station, and force main to the lagoons.

As indicated on the questionnaire, we have not as yet authorized any other community in our state to embark upon this style of sewage disposal. Since our Legislature termed this project as experimental, we will

await the performance of the disposal plant before any other municipality is permitted to utilize this system.

Pennsylvania—The Pennsylvania Sanitary Water Board has authorized the construction of one sewage lagoon to serve a subdivision of 37 houses under the provisions of an experimental permit. The Board resolved that no additional lagoon permits would be issued until this lagoon had operated satisfactorily for a year. This year has not yet elapsed.

Tennessee—If there is any possible way to secure it, we require immediate filling of the lagoon just before sewage is turned into it. This minimizes aquatic vegetation getting started in the lagoon floor. We also require two overflow levels, the upper one at 5-ft. depth, the lower at 4 feet. We require the inlet to be located near the center of the lagoon, the outlet near the embankment, and we prohibit long narrow bodies of water, or those having embayments in the main body. We consider that a square or circular shape is ideal, and that the shape should not depart greatly from these. We require that the embankment be wide enough to permit the operation of a jeep or small truck on it for mosquito control, and that such other control measures be used as are necessary for this purpose. We attempt to keep all lagoons at least ¼ mile from traveled roads, homes and other occupied establishments. In addition to the three now in use in Tennessee, which serve populations from 500 to 1000, two others have been approved for one small town, and one for another small town. A sixth larger town has approval for a 10-acre lagoon to serve a portion of the town until the permanent sewage treatment plant is built at a later date, when the lagoon will be abandoned.

Texas—There is enclosed an inventory of municipal sewage facilities in Texas using oxidation ponds as of 1958. You will notice the total at that time was 152. A number of installations have been built since that time, and some have been superseded by a more permanent type of secondary treatment. As you know, the Texas State Health Department approves oxidation ponds as a temporary means of secondary treatment. Needless to say, some of these "temporary" ponds have been in existence for quite a while.

BREAKPOINT CHLORINATION

Results in a Saving

WARREN W. JOHNSON,
Chief Chemist,
St. Joseph Water Co.,
St. Joseph, Missouri

THE USE of breakpoint chlorination in public water supplies has become widespread in recent years. However, in the minds of some engineers, there remains doubt as to the practicability of this method. Much of the data presented in this paper was accumulated from operating records of the St. Joseph Water Company, St. Joseph, Missouri, a part of the American Water Co. System. This includes savings in cost of operation for the period one year before breakpoint chlorination was started and one year after.

Prior to July, 1957, at the St. Joseph plant, we used sedimenta-

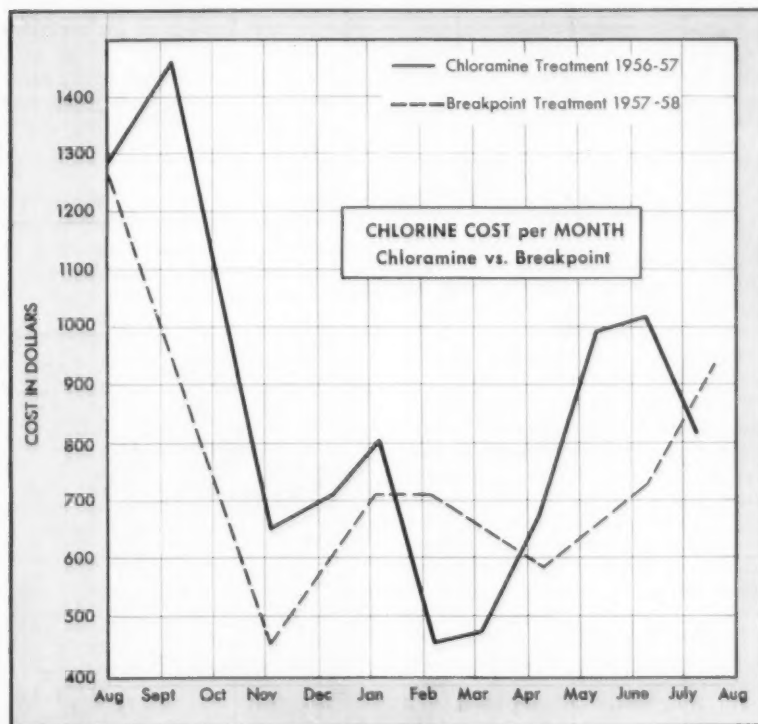
tion, coagulation, pre-chlorination, filtration and post-chlorination. We pre-chlorinated at a rate of 4 to 8 pounds per million gallons. This produced a chlorine residual of 0.15 to 0.20 mg/L on top of the filters. After filtration, when the water temperature was above 50°F, ammonium sulfate was added and post chlorine treatment was applied at a rate of 10 to 20 pounds per million gallons. This treatment would give a residual of 1.0 to 0.5 mg/L as chloramines in the plant effluent.

In July, 1957, the St. Joseph Water Company extended its filter capacity by 6 mgd. With this additional capacity we can deliver 20 mgd and stay well within 2-gpm per sq. ft. At this same time we installed two Wallace & Tiernan series A-711 V-notch chlorinators (each chlorinator has a capacity of 2000 lbs. per day), a liquid chlorine evaporator,

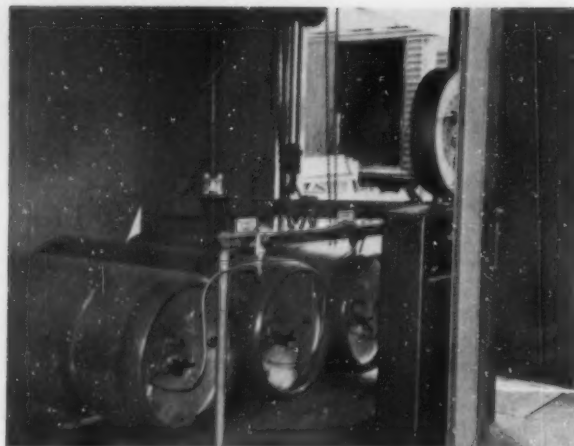
and facilities for handling ton cylinders of chlorine. We are now purchasing chlorine in one-ton containers at a much lower cost than we could formerly when we were limited to 150-pound cylinders.

The plant's unloading facilities can be used for unloading cylinders from either a railroad car or a truck. The cylinders are placed on rails and rolled into position for movement into the chlorinator room, where three cylinders can be placed on a dial indicating scale at one time. These are connected to a header which carries the liquid chlorine to an electric operated evaporator where the liquid is converted to gas. The A-711 chlorinators are connected to a common header giving us a total capacity of 4000 lbs. of chlorine per day. Two additional chlorinators are connected into a common header for final chlorination.

With the addition of the new equipment we started breakpoint chlorination. The chlorine solution is applied in the inlet of a 36-in. conduit, 400 feet in length, connecting the 4-million gallon coagulation and sedimentation basin and the 3-million gallon sedimentation basin. We believe that chlorinating in a closed conduit assures the complete use of chlorine in removing the last traces of color, iron and manganese and odor. The effluent from the 4-mg basin has an average turbidity of 25 to 40 units and a pH of 7.5 to 8.0. The chlorine application at this point is adjusted to satisfy the chlorine demand of the water and the organic matter. The retention time in the conduit is 2½ minutes at a pumping rate of 12 mgd. This gives the water a velocity of 2.61 ft. per second through the conduit. The chlorine residual at the end of the conduit (the entrance to the 3-mg sedimentation basin) is 1.0 to 1.5 mg/L. The retention time in this final sedimentation basin is 6 hours at a 12-mgd rate. The chlorine dose is adjusted and carefully controlled to a point where the chlorine demand is satisfied. After this point is reached a little additional chlorine



● COMPARISON of cost data for periods before and after the use of breakpoint chlorination shows net savings in chlorine cost. Other savings resulted in addition.



● IN THE chlorination room, three one-ton cylinders can be placed on dial indicating scale (right) at the same time.



● CHLORINATORS at right, with one-ton daily capacity each, treat water going to the filters. Units at left post-chlorinate.

results in a residual rise, and by this method of control the water from this basin goes on the filters with a residual of 0.75 to 1.00 mg/L free chlorine. The effluent from the filters will have a residual of 0.5 to 0.75 mg/L when pumped into the distribution system. However when the water temperature is above 60°F we find it necessary to post chlorinate to maintain a free chlorine residual of 1.0 mg/L for delivery to the distribution system.

Breakpoint chlorination has developed a wealth of knowledge in this new field of study in our plant. Although considerably more pounds of chlorine were used with breakpoint, our cheaper cost by being able to purchase chlorine in ton cyl-

inders has enabled us to make a saving of 16 percent the first year in favor of the breakpoint method. In addition, breakpoint chlorination has enabled us to discontinue the use of ammonium sulfate which saved us another \$1200 per year. We have also discontinued the use of copper sulfate in our sedimentation basin for algae control and with the prevention of growth of algae and slime on the filter beds, we are able to obtain longer filter runs.

Missouri River water is known for a non-confirming gas forming bacteria that causes a spurious presumptive test result in lactose broth with 48 hours' incubation which has to be confirmed in brilliant green bile or some other selective media.

In our case, before breakpoint chlorination, it was necessary to confirm 69 percent of the tests on the filter effluent and 29 percent of the tests made on the distribution system. With breakpoint chlorination it was necessary to confirm only 1.12 percent of the tests on the filter effluent and 0.71 percent of the tests on the distribution system.

This alone represents quite a savings in laboratory work and the cost of media. It should be pointed out that the very low percentage of tests that had to be confirmed, started right after breakpoint chlorination was commenced.

This article is based on a paper presented at the meeting of the Kansas Section, American Water Works Assn.

Prestressed Tanks Float in Muck

FOUR digesters and six settling tanks, all of prestressed concrete construction, are now being erected at the Metropolitan Syracuse Treatment Plant of the Onondaga Public Works Commission, Onondaga County, N. Y. One of the major reasons for prestressed concrete construction is to reduce loadings on the soil, since the digesters will more or less float in the muck prevalent in the valley area contiguous to Syracuse. The structures were designed to withstand large stresses resulting from settlements.

The digesters which measure 100 feet in diameter by about 30 ft. high are being erected on concrete base slabs 3 feet thick. The settling tanks which are 122 ft. in diameter with 13-ft. walls are mounted on slabs that vary from 5 ft. in thickness at the center to 2½ ft. at the edge. The

walls of the digesters are of 8-in. poured concrete whereas those of the settling tanks are of 5-ft. thick pneumatically applied mortar.

The three fixed concrete roofs are dome shaped, and 10 inches thick at the edges, tapering to a 2½-in. thickness at the center. Eight-inch thick lean concrete covers are placed over the structural roofs to counteract the stress set up by the gas pressure on the under side of the dome. Prior to applying the covers, bond breakers are applied to prevent the covers from adhering to the structural roofs.

Dome edges are prestressed with seven wraps of wire while the walls require only two. Mortar is pneumatically applied between each layer, and the completed job receives a protective pneumatic mortar covering.

O'Brien & Gere, Syracuse, were consulting engineers on the job. The prestressed concrete construction is being handled by Preload Concrete Structures, Inc., of Westbury, N. Y.



ARE YOU A PACKRAT?

W. W. COBURN

Planning Department,
Metropolitan Dade County, Florida

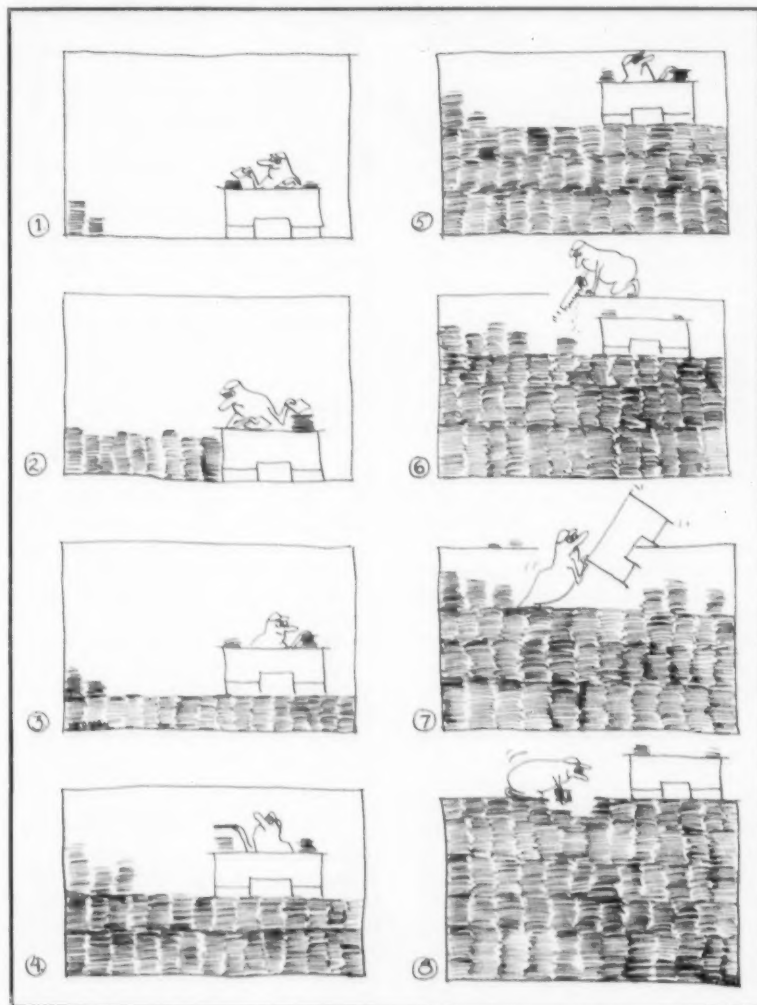
GRANDMA MCGREGOR—God rest her departed soul—was one of the finest, sweetest persons ever to draw breath, but she suffered from a seemingly incurable malady that became more chronic as she grew older. Grandma McGregor had "packratitis" and she had it bad! When she died they found her attic, her cellar, her spacious pantry, fourteen closets, two spare bedrooms, and both floors of the barn jam packed with everything from broken corset stays to the hood ornament of a 1912 Stanley Steamer. You see, Grandma just could not bear to throw anything away. After all, one never knows when that empty liniment bottle or those old lamp wicks (only slightly used) might come in very handy. And besides, it's certainly common knowledge that even the most insignificant things invariably become indispensable the instant they are destroyed, and she just wasn't about to take any chances. No siree!

Businesses and governments—especially governments—are a lot like dear old Grandma McGregor. They often suffer from "packratitis" too. In fact, it seems to be an occupational illness of long standing. Walk through any city hall or courthouse over ten years old. Check the office files; look in the vaults; go down in the basement; climb up in the attic. If you do not find bulging filing cabinets, crammed transfer cases, sagging shelves, bursting boxes, stacks of books, piles of bundles tied with string, rolls of plans, maps, and charts, etc., it will be a rare exception indeed. The dust, the cobwebs, the junk-pile disorder immediately tells you these records are not exactly essential to the conduct of daily business and you wonder how long it has been since anyone attempted to refer to them. You think of the clerks in their white nylon blouses

and starched shirts and you don't blame them for saying the record no longer exists instead of searching through such a mess. In all probability, many of the department heads have long since forgotten that the old files are there.

Meanwhile, the packrats keep throwing it in and piling it on, and the mountain of useless paper continues to grow. Extremely valuable floor space (how much per square

foot in your building?) is occupied by filing cabinets and storage shelves instead of badly needed desks and chairs and labor-saving office machines. As government services continue to increase—both in number and in scope—departmental operations must, of course, expand. More people are hired, desks and tables are shoved together, offices become overcrowded, noise and confusion increase, men-



Cartoon by Richard Hedman

● EXAGGERATED? Perhaps, but we all have seen offices that approach this state.

tal concentration becomes difficult, and efficiency drops.

Am I suggesting that all a city or county has to do is periodically weed out its files and dispose of the obsolete and useless material and immediately space shortages disappear, efficiency soars, savings quadruple, and all is sweetness and light? Of course, not. I am saying that overcrowded conditions, and all of the attendant problems, which plague many governmental jurisdictions today can be substantially alleviated by a systematic program of records evaluation, storage, and disposal.

Included in such a program are the following basic ingredients:

A complete and detailed inventory of existing records—in storage areas as well as in offices.

A comprehensive retention and disposal schedule acceptable to department heads and supervisors.

Creation of a high volume, low cost central storage area for semi-active and inactive material.

Necessary procedures for enforcing the established retention periods. These may involve spot checking files during the annual audit or prior to approving purchase requisitions for additional filing equipment.

In the majority of offices only certain files are referred to with any degree of frequency and these often comprise a rather small part of the total accumulation. As may be expected, the ratio of active to inactive material depends on the functions of the department. In a staff operation, such as a planning department, there is comparatively little routine paperwork. Records of that type retain their value for extended periods of time. Many continue to be useful as active reference material long after they cease to be working files; consequently, establishing an automatic disposal date for them is often impossible. In such cases, selected files are retained on a permanent basis until their contents become obsolete, after which they are discarded as routine material according to the schedule.

On the other hand, a line department such as public works or parks and recreation each year creates a sizable volume of records which have absolutely no lasting value. The forms are completed, filed, and seldom, if ever, referred to again. This is the kind of paper that clogs office files, ties up equipment, and wastes space. It is the treatment of this material that separates the effi-

cient managers from the packrats—the weeder outers from the hoarders.

What makes a person a packrat? What is the underlying psychology? Basically it is fear. The records saver is afraid he may be asked for something and will not be able to produce it. He fears embarrassment and criticism, perhaps even investigation, prosecution, and/or loss of his job. He is insecure and lacks self-confidence. Rather than risk a premature disposal, he keeps everything permanently. He may have filing cabinets stacked to the ceiling, but he feels safe. Just let them try to collect again for that gross of pencils purchased 12 years ago. By golly, he will show them the cancelled check! A man can't be too careful, you know. And occasionally he has doubts about keeping that 10 year cache of paid traffic tickets, but then some day the Secretary of State may ask about them. Better to be safe than sorry.

The packrat is reluctant to accept the responsibility for classifying his material. He is aware that certain records need to be kept longer than others, but how much longer? Are there any legal requirements? What about administrative and statistical value? Historical value? Have any precedents been established? How about microfilm? Where can he go for advice?

Starting a Disposal Program

In trying to solve these problems the initial contact should be with the state agency that deals with the protection and preservation of public records, commonly called Historical Commission, State Archives, etc. For example, the State of Michigan has a very definite procedure, established by statute, for obtaining permission to dispose of obsolete public files. Many other states undoubtedly have set up similar procedures and the agency which administers the program can be of great help to an inquiring local official.

Legal requirements should be discussed with the governmental unit's legal counsel who is in the best position to advise on the existence of state statutes, Attorney General opinions, city charter provisions and ordinances relating to specified retention periods for various groups of records. The Michigan Elections Law, for example, requires election records to be kept for specific lengths of time. Another statute establishes retention periods for court records. In short, no records

material of any kind should be discarded without the express approval of the legal counsel.

Administrative and statistical value is often more difficult to determine. An undecided department head may want to discuss this with the City Manager or he may wish to bring it up at a staff meeting to get the opinions of others in the administration. Copies of retention and disposal schedules from other governmental units may prove helpful as guides, but they should not be adopted verbatim. Local governments differ—sometimes substantially—in organizational structure and administration, and a records schedule should be closely tailored to fit the jurisdiction that will use it if maximum results are to be obtained.

Historical value admittedly is not easy for a layman to recognize; therefore, all material to be discarded should be cleared by the state agency concerned with the preservation of historical documents. In Michigan this is compulsory. The records disposal schedule is not only submitted for approval—a trained historian and/or archivist on the Historical Commission staff actually visits the locality and inspects the listed material. A local historical society may be of considerable help in determining the value of certain records. Where such a society exists, it is good public relations to inform them that the city (village, county, township, etc.) is preparing to throw away its accumulation of obsolete files, just in case the society would like to review the material and perhaps add some of the disposable items to their historical collections.

What about microfilming as the answer to a packrat's prayer? It certainly can be . . . and therein lies the danger. Give a packrat a camera, a reader, and an ample supply of microfilm, and you have created a monster. The most effective curb—the shortage of filing space—has been removed and he will furiously and gleefully begin photographing every piece of paper in his department. There is, of course, a need for microfilming in every comprehensive records management program, but it must not be allowed to replace periodic disposal. All too often a record is filmed when it should be thrown away. Microfilming is an expensive process, relatively speaking, which should not be applied to material of short-term value. In some jurisdictions, depending on local conditions,

it may be cheaper to keep inactive or semi-active records in low cost storage areas for 25 or 30 years than to photograph them. This can be accurately determined only by an analysis of specific filing and storage costs.

Permanently valuable records of considerable bulk, such as council proceedings, assessment rolls, engineering records, etc., are the kind that offer the highest return for the microfilm expenditure. Tremendous amounts of space can be saved by filming such voluminous material. Also, the objective may be the protection of vital documents, or perhaps both. If microcopies are made for security purposes, make certain the films and the original files are

not stored in the same place (as was the case in one city). And if space conservation is the goal, do not retain both the original and the photocopy (as has also happened).

Significant dollar savings can be realized by smaller localities through the joint purchase of a microfilm camera. Each cooperating jurisdiction uses the camera an agreed upon number of weeks or months per year and maintenance costs are shared. Each, of course, uses its own personnel and buys its own reader. Six municipalities in southeastern Michigan have been participating in such a joint microfilming venture for several years and each has profited from it. With very little effort you, too, can estab-

lish an equally successful arrangement with your neighboring communities.

And so, in closing, I would like to pass on to you persevering readers my hitherto secret prescription for packratitis antidote as confidentially told to me by a former king of the packrats who succeeded in kicking the habit, so to speak. "Take one part courage and one part self-confidence, throw in a pinch of desperation, add a drop of reckless abandon and a generous portion of common sense, stir violently over an intense fire of enthusiasm, then mix with a fifth of Canadian Club and consume at one sitting."

You will be amazed at the results!

A REPORT on WICHITA'S Water Supply

WATER is supplied to Wichita, Kansas, from 88 wells; 27 near the city water plant, and six in a reserve field near Bentley, Kansas, are shallow wells. These constitute a reserve and draw water from the Arkansas River underflow. The city's principal well field near Halstead, Kansas, consists of 55 deep wells in what is known as the Equus bed and 94 percent of the water used during 1958 was drawn from this source.

The Equus bed is an underground formation of unconsolidated sands and gravels. Underlying the formation is impervious shale which forms a great natural reservoir that is approximately 265 feet thick in the Wichita well field. Abundant rainfall for the second consecutive year has produced a net gain in reservoir storage. The water level through the 100 square mile well field area rose an average of 2.4 feet; this was equivalent to all water pumped for city supply use the past four years.

A staff hydrologist is conducting studies of feasible ways of recharging or refilling water storage space in the beds, as this space results from water pumpage. This is basic research in water conservation and utilization. Under consideration are surface soil work projects to retain

rainfall and permit it to percolate through the soil into the beds, and a project to salvage surplus water from the Arkansas River, Little Arkansas River and Kisawa Creek. Ways are being sought to use this surplus to recharge the beds.

In addition to these ground supplies, federal legislation has been introduced to authorize construction of Ninneseah Reservoir, as an added source of water supply for Wichita. The reservoir, in addition, would provide recreation, fish and wildlife benefits, a gain for citizens and an incentive to further Wichita area development. The city's share of the reservoir costs would be paid to the government over a 40-year period from current water revenues. Additional revenue bonds were authorized in the 1956 election for pipeline connections to the reservoir and for pumping station and equipment.

Rainfall Affects Revenues

The operating revenues in 1958 were \$4,110,554. Above-normal rainfall reduced customer water use and revenues. This is illustrated in the chart herewith which compares water use by metered residential customers during the months of June through September for the past five years. Water demands for personal

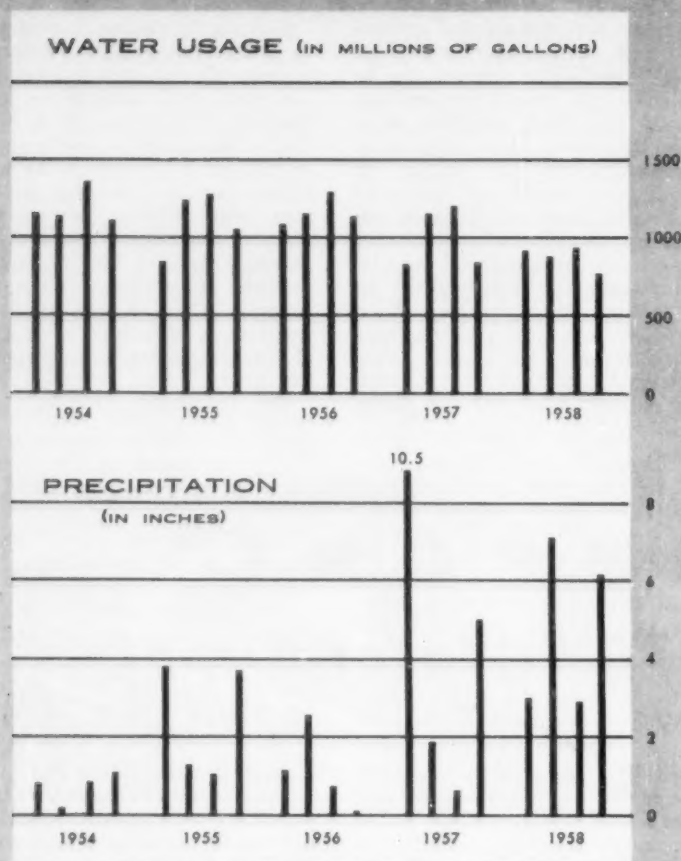
consumption, sanitation and industry remain fairly constant. That required for lawn and garden sprinkling and for air conditioning fluctuates with precipitation and temperature during the June-September period.

The number of accounts have increased from 63,876 in 1956 and 67,307 in 1957 to 67,973 in 1958. There were 85 percent more residential customers in 1958 than in 1948, and the number of commercial customers was 32 percent greater than 10 years ago. The number of industrial and municipal customers was about the same as 10 years ago.

Water rates remained constant. Black & Veatch, consulting engineers, completed a water rate study for the city early in 1959. The study concluded that no general increase in rates is required at this time, and that rates in effect in 1958 will yield adequate, long-term revenues, assuming future precipitation does not consistently exceed the averages.

Operating revenues permitted the Department of Water to meet all obligations, make satisfactory system expansions and credit an additional \$540,000 to the waterworks revenue bond reserve fund. Operating expenses totaled \$1,005,935 for the fiscal year. Revenues were lower than estimated as a direct result of

JUNE-SEPTEMBER



● **RELATIONSHIP** between water usage and precipitation, for the June-September period, over five years. Low rainfall in 1954 corresponded with heavy water usage.

the increased rainfall. Through the summer months there were numerous showers, evenly spaced, in the period when residential water demands are highest due to uses for lawns and gardens.

As a significant addition to the city's source of water, twenty new wells and connecting pipelines were completed. The work was done in 1958 and the wells and lines were put into service shortly after January 1, 1959.

Development of a water supply for the years ahead has held priority in municipal affairs since 1955. Water demand increases are based upon rising rates of water use and upon population projections for the city. In the latter instance, the 1975 population in the metropolitan area, as predicted in the "Wichita Economic Base Study 1957," is expected to range between 478,570 and 526,430.

A study of present system capacity was made during 1958. A McIlroy analog computer was employed in the analysis of the distribution system. A hypothetical production and distribution hourly rate of 100 million gallons daily was assumed for this analysis. Results disclosed (1) that the sources of supply, transmission lines and purification plant were entirely adequate; and (2) that additional elevated storage and connecting pipelines were required. This had been anticipated and the construction program was begun in 1958. Plans are to complete the work in 1960 or 1961 at a total cost of \$1,116,800.

These data are from the first annual report to be published since creation of the integrated Wichita water utility. The city purchased the pumping and distribution properties of the Wichita Water Company on October 30, 1957. These

were integrated with the production and purification properties of the City of Wichita.

Fred H. Backstrom is City Manager of Wichita. Robert H. Hess is Director and R. W. Johnston Operations Chief Engineer of the Department of Water. Division heads are: Harry Laubhan, records and accounts; O. K. Brandon, production and purification; W. O. Thompson, pumping; K. J. Svaty, design and planning; Richard McClintock, services; and John Walsh, mains. Gilbert Stramel is hydrologist.

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Green Slush Prevents Corrosion

Motorists driving through many of the nation's Midwest cities this winter may be alarmed to see green snow, or rather green slush, covering many of the streets and roads.

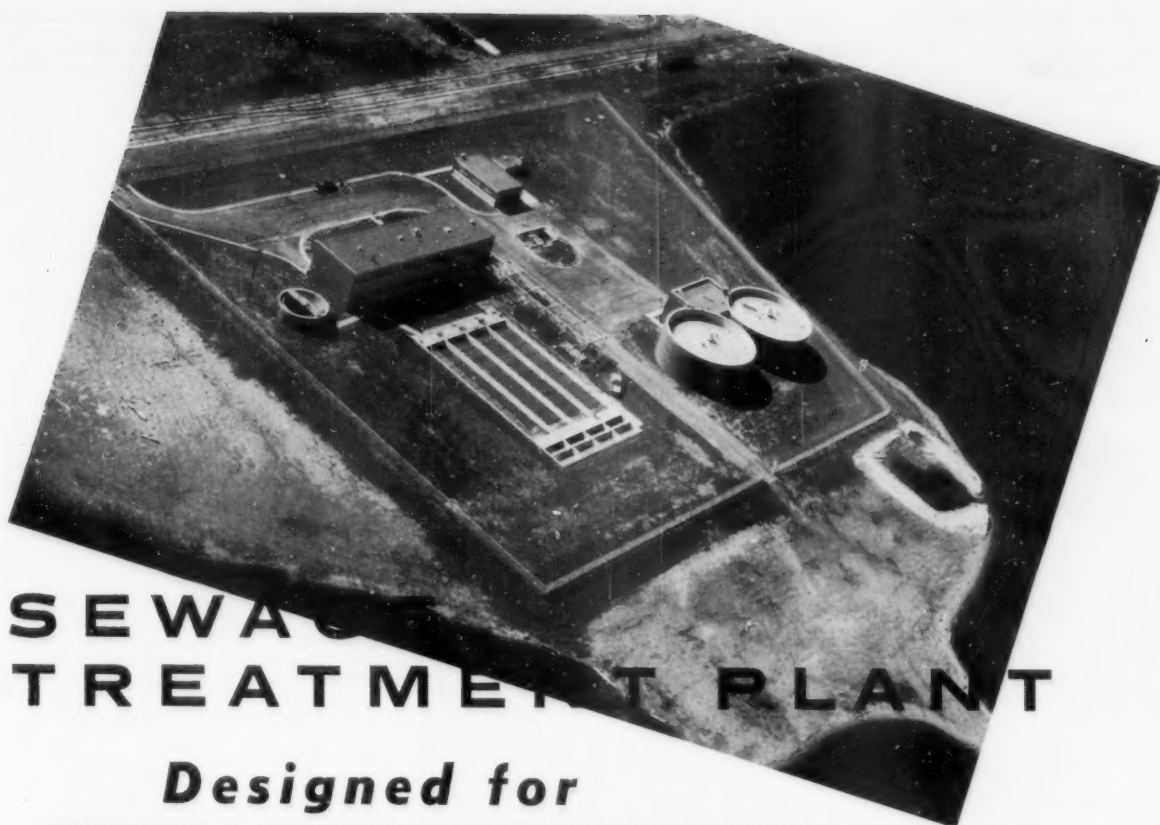
The green slush is a joint project of the Carey Salt Co. in Hutchinson, Kans., and the Calgon Co., Pittsburgh, Pa. Calgon manufactures Banox, a protective additive for rock salt that eliminates as much as 90 to 95 percent of all salt brine corrosion to automobiles, bridges, roadside structures, walkways and street maintenance equipment.

Banox is not added to the salt until there is an actual order for it. But once the order is received, the batching operation is a swift and simple one. The proper grade salt for street use, generally medium rock salt, is fed onto conveyor lines in predetermined batches. Enroute to the shipping docks, one percent of Banox by weight is added to each load of salt via overhead hoppers with automatic proportioning devices. Coloring is added for identification.

The Banox-salt mixture is generally sold in bulk form, although some of it is packaged in 100-pound bags. Orders usually are for 5, 10 or 20 tons which may be delivered by truck or railroad cars. Most of the color-coded, de-icing compound is delivered in bulk form by truck directly to the storage areas of the ordering cities.

Municipal authorities estimate the cost of Banox treatment at a few cents per capita per year. Some find the cost of the inhibitor is more than offset by the reduction of maintenance on salt trucks alone.

The protection carries over after winter has passed, since salt brine lodged in fender and body joints remains a corrosion threat. With Banox-treated salt, the protective film continues to inhibit rust far into the Spring.



SEWAGE TREATMENT PLANT

Designed for OPERATOR EFFICIENCY

LESTER D. LEE

President, Hitchcock & Estabrook, Inc.,
Consulting Engineers
Minneapolis, Minnesota

LOCATED at the head of Lake Superior, the City of Superior, Wisconsin has the largest ore docks in the world and the Port of Superior ships more iron ore tonnage than any other port.

In the past years, several villages consolidated with Superior and in the process adjacent agricultural land was included. Consequently the area of the city is about 45 square miles and includes a considerable portion undeveloped as urban property. The percentage of undeveloped land with all utilities available is considerably greater than in most cities of similar population. Present population is about 35,000, but with industrial wastes the sewage load has a population equivalent of about 50,000.

About ten miles of interceptor sewer line was laid between 1938 and 1940 under the WPA program. The interceptor system was designed to conduct all sewage to Lake Superior at a point where land ade-

quate in size for a treatment plant was owned by the City. However, most of this land was under water to a depth of from four to twelve feet.

In 1947 the City Manager, together with the City council, decided to comply with the recommendations of the State Department of Health and proceed with the construction of a primary type plant. The firm of Hitchcock and Estabrook was selected as architects-engineers for this project and was directed to proceed as rapidly as possible with the plans.

Plans for the entire plant, including the grading, were completed in 1948. In addition to the treatment plant they provided for an incinerator of adequate size to burn all sewage sludge and all municipal refuse. Because of poor soil conditions, our design called for piling to carry all buildings as well as the large size cast iron pipe. Wood piling was to be used for all structures and the cut-off point was to be not higher than two feet below low water level. The estimated cost at that time was \$1.3 million. Construction was scheduled but it became a political issue and a majority of the city coun-

cil was defeated for re-election in the spring of 1949. As a result the project was delayed until the State Supreme Court ruled that the City must proceed. During the intervening years, 1949 to 1956, bond interest rates nearly doubled and construction costs went up at least fifty percent.

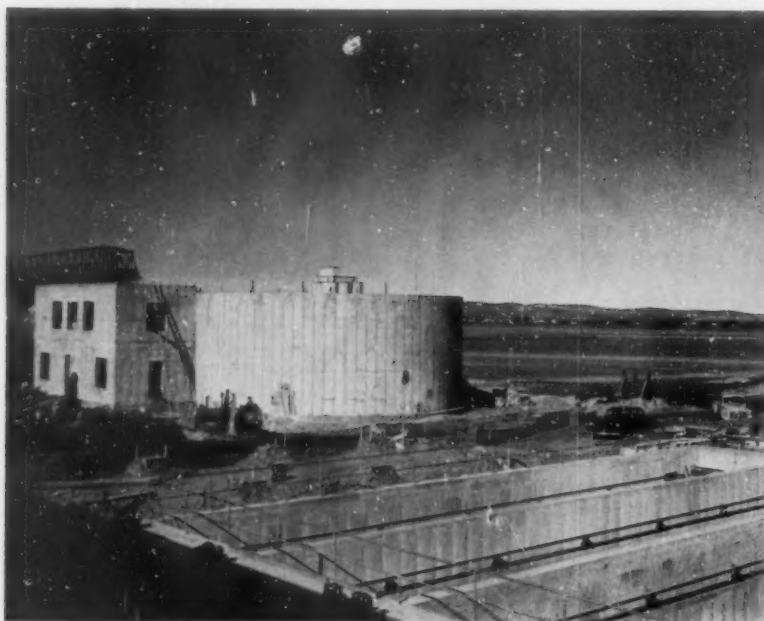
Late in 1954 the U. S. Corps of Engineers let a contract to deepen a nearby ship channel by hydraulic dredging. Prior to the letting of the Government contract, the City agreed to permit the contractor to deposit excavated lake sand on the site of the proposed treatment plant. This enabled the dredging contractor to dispose of his excavated material in an economical manner and at the same time enabled the City to obtain the fill without cost, a saving of about \$100,000. An irregular area of some 600 by 900 feet in Lake Superior was filled in this manner and was used as the site for the plant.

In the fall of 1955 the City officials decided to use other plans, omitting the incinerator and thus reducing the cost of the project by an additional \$100,000. Bids were taken and the project was placed under contract in December, 1956, at a cost of

about \$1.5 million. The general contract was awarded to Steenberg Construction Company of St. Paul; the plumbing, heating and ventilating contracts were awarded to Stack Brothers and the electric contract, to Benson Electric Company, both of Superior, Wisconsin. Wisconsin state law requires the separate contracts listed above.

Sewage Lift Stations

The plant was designed for a flow of 15 mgd. Average flow was estimated at 5 mgd, based on 30-day readings taken at 22 gauging stations in all sections of the city.



● DIGESTERS are 55 ft. in diameter and 20 swd, with floating covers on prefabricated aluminum panels. The Pearth system is used on the primary digester only.

During 1948 to 1956, new residential development took place in the southeastern section of the City and required the construction of an additional lift station, making a total of seven. All lift stations are equipped with non-clog pumps with a built-in screen which prevents solids from reaching the impellers. Each station has two pumps which are controlled by automatic float switches and which provide alternate operation. Pilot lights on a panel board in the main control building at the sewage plant show which pumps are in operation at the stations. A timer is provided to show the total time each pump operates during any given period. Thus the operator can determine whether or not the pumps are operating and also whether they are alternating properly. Routine calls at all lift stations will still be re-

quired to clean, grease, and maintain equipment but the period between calls will be much longer because of this panel board, thereby saving a substantial amount of time and money.

Raw sewage reaches the treatment plant through a by-pass structure which has a fixed concrete weir. When the total flow exceeds 15 mgd the excess flow goes over the weir and is by-passed to the lake through a sixty-inch corrugated steel pipe which is entirely submerged below the lake level. This is required because the sewer system is of the combined type.

Screening and Grit Removal

Sewage to be treated flows through a mechanically cleaned bar screen, equipped with a cutter to shred solids. This equipment is housed in a small rack house building. All electrical equipment in this building is explosion-proof and heat is provided by an explosion-proof electric heater.

Sewage flows from the rack house into a concrete wet well having a capacity of about 10,000 gals. One wall of the wet well acts as a joint wall between the wet well and the pump room of the pump house.

Four variable speed pumps are installed, complete with float controls to pump the raw sewage to an aerated grit settling tank. Motors for the pumps are installed above grade and are connected to the

pumps by vertical shafts. Three of the pumps each have a capacity of 2100 gpm and the fourth pump has a capacity of 4200 gpm.

A separate electric control panel installed in the pump house also controls the rack house. Pilot lights show which pieces of equipment are in operation. Electric service to the plant is provided by an outside substation with underground connection to a main panel board located in the control building. This panel board is also equipped with pilot lights showing which motors are in operation. All motors can be stopped at this board but cannot be started from this point. A power panel board is also located in the digester building to monitor equipment in that area.

The tank for the removal of grit consists of two compartments, either of which may be used independently. Each compartment is equipped with swing type air diffusers. Three positive displacement blowers, each having a capacity of 130 cfm at 5 psig, provide the air for the grit settling process.

Settled grit is removed by a process developed especially for this plant. Each compartment of the grit tank is equipped with three hoppers. A pinch valve installed in each hopper is normally open so that grit falls through the valve into a cast iron pipe below. The valves are operated on a definite open and close cycle by compressed air. Plant effluent is pumped through the cast iron pipe at high velocity, thereby flushing the grit to a settling pond. As soon as the flushing cycle is completed, the flushing water pump is stopped and the pinch valves are opened to receive the next charge of grit. The pinch valves are ideal for this purpose since there are no moving parts exposed to the grit other than the rubber valve liners which expand and contract as air is applied or released. The operation of this system is by time clock or manual and may be varied as necessary.

Settling Basins

Sewage flows by gravity from the grit tank to four longitudinal settling basins, each 120 ft. by 16 ft., 10 ft. swd. The weir length per basin is provided by 64 ft. of V-notched aluminum weir plate. Longitudinal and cross collectors are furnished for sludge removal. Sludge is pumped from the sedimentation tanks through the heat exchanger into the primary digester.

Aluminum manhole covers were installed at the scum removal tank,

at the effluent manhole and for all of the shear gates which control the inflow to the tanks. The settling basin area is provided with flood lighting and suitable aluminum hand rails.

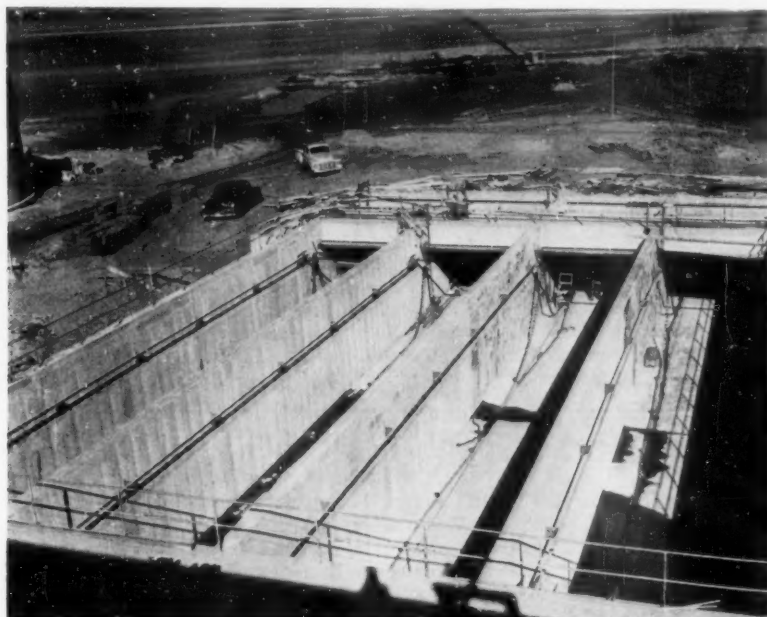
Plant effluent flows into a 36-inch corrugated steel outfall line extending into the bay for a distance of about 1200 ft., with the terminal end submerged in about 15 ft.

Chlorination

Chlorination equipment of the evaporator type is provided in duplicate. Each machine uses about 35 gpm of water and the normal meth-

a platform scale together with chain hoist and monorail are used for handling the containers. Storage space near the main building can accommodate about forty containers, thereby permitting the purchase of chlorine in a quantity sufficiently large to obtain the lowest possible price.

The plant water system uses city water and consists of two pumps, each with 150 gpm capacity against 200 ft. head, and a 1500-gal. pressure tank. A small air compressor is connected into the pressure tank to prevent it from becoming waterlogged. The pumps and the com-



● SETTLING BASINS are 120 ft. by 16 ft., with Link-Belt equipment. The settling basin area is provided with flood lighting and aluminum hand rails, not shown here.

od of operation is to use plant effluent for this purpose. An automatic valve has been provided, however, so that in case the chlorine injector water pump fails, the plant water supply will automatically feed either chlorinator with no interruption in the chlorination schedule. These machines may be operated manually, by programming or automatically in direct proportion to the flow of sewage as shown by a venturi tube and metering device. Facilities were installed to permit three-point application of chlorine at the by-pass structure, at a pre-chlorination manhole located between the grit tank and the sedimentation tanks, and at the effluent manhole. Valves have been provided so that chlorine may be fed to either or all points of application simultaneously. Chlorine is purchased in one-ton cylinders and

pressor are controlled by pressure switches which operate the entire system automatically. Water from the plant system is used for emergency chlorination, for water seals on pumps and for all other operations around the plant, thus preventing possible cross-connections with the city supply.

Pumps have been provided to utilize plant effluent for the elutriation tank, for sprinkling, for chlorine injector water and for flushing grit lines. This feature saves a substantial amount of city water since at times as much as 300 gpm of the plant effluent is being used. A large duplex strainer with 3/16-inch slots in the baskets has been installed on the suction side of all pumps which use the effluent water.

Digesters are 55 ft. in diameter with 20-ft. swd and are equipped

with floating covers of prefabricated aluminum panels. The Pearth system of scum control has been used for the primary digester only. With this method, sewage gas is circulated through the contents of the digester by means of a compressor. Circulation of the sewage gas possibly accelerates the digestion process and also prevents formation of a heavy scum blanket at the top of the digester. This gas compressor, together with its control panel, is mounted on the floating cover of the primary digester. A timer is included and gas goes to different sections of the digester at intervals determined by the operator.

Walls of digesters are constructed of cast-in-place concrete covered with two inches of fiber glass insulation. Exterior walls are of brick. Piping is so arranged that the overflow from the primary digester goes to the secondary digester by gravity. Supernatant liquor flows by gravity to the grit tank or to the wet well at the option of the operator. Either digester may be heated. The pumps which circulate the sludge through the heat exchanger are thermostatically controlled and at present the temperature is being held at about 90°F.

Sewage gas from both digesters is utilized for heating purposes throughout the plant. Three gas meters are installed to meter gas which goes to the waste gas burner, that used for heating the digester and the digester building, and that used for heating the main control building. Each heating unit is equipped with automatic controls so that sewage gas is utilized to the fullest possible extent. An automatic regulator valve opens and permits the entry of city gas at any time there is insufficient sewage gas to feed either of the burners. Pilot burners are operated entirely on city gas.

Digested sludge is pumped to an elutriation tank where it is mixed with plant effluent water for a period of about ten minutes. The washed sludge is then pumped to coil type vacuum filters where ferric chloride is added. The ferric chloride is purchased in 300-lb. containers and an electric hoist together with monorail was provided to facilitate handling.

Filter cake, containing about 70 percent moisture, falls onto a conveyor belt and is carried to a hopper on the second floor of the main control building. It is then dumped into a truck and hauled to the city dump which is located on the shore of Lake Superior. The filter cake has little or no odor and it is ex-

pected that a portion of the material will be used for fertilizer purposes by the City Park Board.

Other Facilities

A fairly complete laboratory is located on the second floor of the control building. It is expected that a program will be set up in the near future to maintain records of coliform organisms appearing at the public beaches, thereby determining the required amount of chlorination.

Everything possible has been provided for the convenience of the employees including tiled showers and steel lockers as well as a modern lunchroom complete with an electric stove and refrigerator.

The entire site is surrounded by an eight foot cyclone fence. Bituminous driveways and concrete walks were also included in the general contract. All other areas inside the fence were covered with top soil and seeded. Shrubbery will be planted by the employees.

Placement of the new 36-in. outfall line from the treatment plant to the lake was handled in an unusual manner. The pipe was assembled on shore in 300-ft. lengths with sealed joints and with water tight bulkheads equipped with gate valves. These sections were then floated into place and sunk. Connections were made by divers after the pipe was in place.

Water Hammer Problem

After placing the plant in operation a serious case of water hammer developed in homes at a point some 500 ft. distant. The 6-in. service to the plant runs at right angles to the main in the street. The plant water system is fed from a 500-gal. open tank, which in turn is supplied by a 4-in. city water line. This line is controlled by a slow acting float valve in the tank. No sound could be heard and no vibration could be felt in the water line at the plant but faucets in homes in that section of the city were being damaged by excess pressures. A recording pressure gauge was installed in homes at various points near the plant to determine the cause of the damage. This showed that pressures jumped to about 150 psi when the float valve closed. The problem was solved by adding two air chambers near the float valve and by partially closing a gate valve in the 4-in. line.

Financing

Financing for the project was the subject of discussion for a number of years. At one time a firm offer was made by a leading bond firm to

buy the bonds at 2½ percent interest. That quotation was based on twenty-year general obligation bonds under which the credit of the City would have been used to guarantee payment of the bonds. A change in public officials occurred at about that time and the bonds were not sold. The matter lagged until 1956 when revenue bonds running for a forty-year period were finally sold at an interest rate of about 4¾ percent.

A schedule of charges for the use of the sewer system and sewage treatment plant was set up and approved by the State Public Service Commission. The matter of billing and collecting the sewage charges posed another problem. The water system in Superior is privately owned by the Superior Water, Light and Power Company. The sewage rate schedule as established did not fit well into the billing operations of the water company and consequently the billing and collection of the sewage charges is handled by the City. The water company has cooperated in every way possible and provides the City with a copy of the water meter readings which are used in connection with the billing of sewer charges.

The total cost of the project including the engineering fees, legal fees, purchase of equipment and other incidental costs amounts to about \$1.75 million. The City received a grant of \$250,000 from Federal funds toward the construction of this plant. Annual cost of operation has been estimated at about \$80,000 and the annual cost of debt service, including principal and interest for the revenue bonds, is about \$100,000. It is expected that the sewage service rates, as established, will provide approximately \$180,000 annually.

In order to sell revenue bonds it is necessary to establish a fairly large cash reserve to cover possible deficiencies in collections. In this specific case, if actual revenue from the sewage charges approximates the estimated amount, sufficient cash will be available to retire the issue in about thirty years.

The complete plant presents an attractive appearance to the public and the total cost will be less than the cost of a pound of coffee per family per week. Resident supervision of construction was under the personal direction of E. W. Berg, Director of Public Works for the City of Superior.

SEWER SYSTEM FOR 600 HOMES

A SMALL community in the northwestern part of Mississippi, Ruleville, is putting the finishing touches on its new \$250,000 sewer system. To serve approximately 600 homes, the system will include 50,000 feet of eight-inch pipe laid at depths ranging from four to

17 feet deep, placed in 24-inch wide ditches. Donald Sharp of Louisville, Miss., is the contractor. His equipment consists of an International T-340 crawler tractor with dozer blade; a Drott T-340 Four-in-One, and an IHC 460 industrial tractor with Pippin backhoe.





riding surface than 20-ft. and 30-ft. joints previously used on concrete roadways in the state.

Expansion joints are used only at fixed objects such as bridge ends. Sawed longitudinal and transverse joints are used on concrete pavements, and tie bars are used along longitudinal joints.

The design of concrete pavement is developed from a formula based on the triaxial compression test on

● **SIGNS** are important for guidance of the motoring public as well as for public relations. This easily legible sign is on Interstate 35, near Olathe.

THE INTERSTATE HIGHWAY SYSTEM: A Report on Progress in Kansas

THAYNE SMITH,

Director,

Public Information Department,
State Highway Commission of Kansas

KANSAS is proud of the fact that it was the first state to complete an Interstate Highway contract. This was eight miles of concrete pavement and was opened in November, 1956. Progress on the Interstate system in the state has been rapid and Kansas has ranked in the top 10 states in the nation in the program since it was started.

It all depends on Congressional action, of course, but under the present schedule, Kansas will have about 360 of its 803 miles of Interstate highways completed by Jan. 1, 1960. This includes two sections (totaling 187 miles) of the present Kansas Turnpike. One extends from Kansas City west to Topeka, and the other from Emporia southwest to Wichita and south to the Kansas-Oklahoma border. The 49-mile stretch of the Turnpike from Topeka southwest to Emporia has not been designated as part of the Interstate network.

On July 1, 1959, the state had 136 miles of Interstate roadway under construction and another 205 miles in the preliminary engineering and right-of-way stage.

There are three Interstate routes in Kansas. They include I-70, which will extend completely across the state east and west; I-35, which will include a large portion of the present Turnpike along with new alignment, and I-35W, which will extend north and south from Wichita to Salina, in the center of the state, providing a connecting link between

I-70 at Salina and I-35 at Wichita.

On July 1 this year, Kansas had \$63,394,388 of Interstate work on the three routes under contract. Projects programmed on the routes on July 1 totaled \$19,210,200.

Most construction of Interstate routes in Kansas will be to established standards and specifications in both urban and rural areas. There are a few exceptions, however, especially in widths of median strips in rural areas.

The Kansas Turnpike has only a 20-ft median, instead of the 60-ft. strip adopted for the Kansas Interstate program.

A small portion of a completed 4-lane rural Interstate route near Topeka, the state's capital city, has a median ranging from 30 to 60 feet. In all other rural areas, 60-ft. medians are planned.

Pavement Surfacing

Surfacing of Kansas Interstate routes are similar to other states, with two major surfacing materials in use.

They are Portland Cement concrete and asphaltic concrete (hot mix). The mileage of each was determined in the fall of 1956 after an extensive study and the results published along with a 13-year construction program schedule.

Standard concrete pavement used on Interstate roads in Kansas is nine inches thick, laid on a 4-in. granular sub-base. Each 2-lane section of the 4-lane routes is 24 ft. wide.

The pavement is reinforced with 61-lb. wire mesh with doweled contraction joints at spacings of 61½ ft. which provides a much smoother

the subgrade soils under consideration.

From strength factors measured in the test, the modulus of subgrade reaction (k) is determined. A modification of the Bradbury formula for concrete pavement design is then applied to produce the structural design of the pavement.

The geometric layout of rigid pavement is based on experience in the state, qualified by AASHTO standards; reinforcement is in accord with ACI recommended standards for concrete pavement design.

Flexible pavement design for the Interstate system is basically the same as that on hundreds of miles of federal and state highways constructed in Kansas during the past 15 years. However, Interstate highways have been strengthened by using a traffic coefficient higher than that used on a non-Interstate route.

This step was taken for two reasons. First, Interstate highways are expected to carry a high volume of traffic immediately after completion. It is anticipated that the traffic volume will include a larger number of commercial vehicles than found on present highways. Second, the Interstate system is designed for longer service than other highways, since limited access, ample right-of-way and advanced geometric design will eliminate the need for future relocation or changes in grade and alignment.

Thickness of flexible pavement is determined by the Kansas triaxial method of design. It uses an empirical formula which integrates data on traffic volume, rainfall, subgrade soil, sub-base, base and surface to



● **LOCAL ROAD** is carried over Interstate 35. Such separations may be continuous concrete hollow box girders or slabs, or steel I-Beams or welded deck plate girders.

provide a rational and balanced design. Numerous preliminary tests are correlated with field performances on existing pavements to establish the method.

Some modification of the original methods have been introduced when the need has been indicated by periodic correlation studies and laboratory research.

Here is a brief resume of consecutive steps taken to determine the asphaltic surface thickness design for an Interstate project: 1) A detailed soils survey is conducted prior to grading operations to determine the types and extent of soils found on the project and affected by grading operations. Representative samples of the soils are obtained and submitted to the laboratory for test. These are disturbed samples taken with an ordinary post hole auger.

2) Samples are laboratory tested to determine particle size, plasticity and compaction characteristics. Data from the tests and field notes are used in selecting representative samples expected to be found in the subgrade after grading is completed.

3) Selected samples are tested in triaxial compression by applying a vertical load at the top of a cylindrical specimen which is supported laterally by constant pressure. The total load in pounds is recorded for each successive increment of deformation. Unit stress is calculated for each of several values of strain and a stress-strain curve is plotted.

4) Applicable traffic and rainfall coefficients are selected from traffic data and a rainfall map showing long-term average rainfall by areas. On the basis of these coefficients and the use of the corresponding thickness curve, thickness of a single designated quality and type of pavement to support traffic over each representative subgrade is determined.

5) Thicknesses of "standard" pavement material are translated into equivalent thicknesses of the actual components to be used in construction. On Interstate highways, the components include an aggregate asphalt base course and an asphaltic concrete surface course. From these, an estimated thickness of pavement required is made for use in preparation of grading plans.

6) When grading operations are completed and specified compaction and moisture requirements attained, a field party is sent out to obtain samples. Undisturbed samples are taken of the top 12 inches of the subgrade, submitted to the laboratory and carefully trimmed to proper size and tested in triaxial compression. Calculations are made as previously outlined, and required thicknesses of each component pavement part based on tests of the actual subgrade as constructed are reported.

7) Final flexible pavement thickness is recommended for construction. If a contract on paving has been let, the final thickness is compared with the estimated thickness reported earlier and adjustments made where necessary.

Shoulders of all Interstate routes in Kansas are stabilized—constructed

of crushed stone with a bituminous-treated surface.

They contrast in color and texture with the riding surface. Thickness of shoulder stabilization varies from five to nine inches. They are six ft. wide on the inside and 10 ft. wide on the outside of each 2-lane section.

Median strips, ditches, and all earthen right-of-way are seeded in grass immediately following construction of the routes. The variety of grass used, and extent of seeding varies from section to section because of climatic conditions.

Bridge Design

The biggest problem in the Kansas program is bridges, railroad and highway separations and their foundations.

Many different types are used, with the flat, unwooded plains of the west, and the hilly, wooded areas of the east again figuring in the picture.

The Geology Section of the Kansas Highway Commission provides both road and bridge designers with detailed pictures of geologic conditions on the Interstate routes.

Details for engineering profiles and cross sections with boundary lines between materials classified as rock or common excavation, a geology report with geo-engineering data as to the workability and behavior of various rock layers and their breakage characteristics are just a few of the items.

There also are reports on the amount of increase or decrease of volume from cut to fill sections, groundwater conditions in regard to both road stability and workability of material, subdrainage information, slides and slip-out conditions, type of backslope required and possible location of materials.

A geo-engineering bridge sheet shows foundation at each bridge site, giving information such as boundary line between weathered and unweathered material, ground-

● **INTERSTATE 70**, west of Topeka, showing traffic using the highway and general standards of design, including median, shoulders and parallel roads for local use.





● AERIAL view shows completed diamond interchange at an important county road. This is Interstate 35 near Olathe.

water conditions, location and depths of borings and penetration drives, as well as other information.

Drilling logs provide drilling pressures required, penetration rate and refusal of test drives. Cores and samples are temporarily filed for observation.

Geology information is obtained by surface field parties consisting of two geologists working together. Information is established by plane-table mapping and by both hand and powered drilling equipment. Bridge information is obtained by three core drilling units and other drilling equipment. Each drill party consists of four men—a geologist in charge, a core driller and two core driller helpers.

A geology interpretation squad at headquarters in Topeka is responsible for detailing the geologic profiles and cross sections, final footing details on the bridge sheets, subdrain layouts and various other detailing. This squad has a geologist in charge, several geologists detailing road profile and cross sections, an engineer detailing bridge foundation conditions and several draftsmen and engineering aides doing preliminary plotting and tracing work.

The Geology Section also furnishes consultation during the construction phase on geologic problems.

Bridges used for stream crossing on the Kansas Interstate system are of several types:

1) Deck Trusses. These are either riveted or bolted with high tensile bolts and deck construction is usually preferred due to high grade lines.

2) Continuous welded deck plate girders. These are used for spans up to 175 feet where it is anticipated there may be hazard from floods on major streams.

3) Continuous reinforced deck girder spans with rigid frame piers. These are used on smaller streams where flood hazards are not so great.

4) Continuous reinforced concrete slab spans with round column piers poured monolithic with the superstructure. These are used on minor streams.

5) Reinforced concrete spandrel-filled arches. These are advantageous on streams with up to 10 square miles of drainage area where rock foundation is available. Conventional cantilever wings are not used at the end of the arches. Instead, the arch section is sloped off to fit the fill.

6) Reinforced concrete rigid frame box culverts and multiple box culverts. These are applicable for streams with less than five square miles of drainage area where drift is not a problem. All the boxes are designed with rigid frames throughout.

Railroad grade separations, highway grade separation and interchange structures are more numerous in Kansas than stream crossings.

Railroad separations are of the following types:

1) Continuous welded deck plate girders, used where the spans are 80 ft. or longer.

2) Continuous rolled beam spans, used for spans from about 60 to 80 ft.

3) Continuous concrete deck girders. Used for spans from 60 to 80 ft. where interference with railroad operations is not serious.

4) Continuous reinforced concrete voided slabs, used for spans from 60 to 65 ft.

Highway separations are of the following types:

1) Continuous reinforced concrete hollow box girders, where a local road is taken over the Interstate route. (This is the most common situation in Kansas.) The piers consist of one or more round columns set on individual footings and the pier cap is inside the hollow box. These structures have excellent appearance and are economical. They are used in spans from 60 to 120 ft.

2) Continuous reinforced concrete voided slabs are used where shallow depth of structure is desired and the spans are not long enough to require box girder construction. They range in length from about 50 to 70 ft.

3) Continuous reinforced concrete flat or haunched slabs with rigid frame piers. These are used for spans from 30 to 65 ft. They have good appearance and require minimum depth of structure.

4) Continuous steel I-beam spans are used where interference to traffic would be serious if falsework were constructed. Spans range from 40 to 90 ft.

5) Continuous welded deck plate

girder spans are used in like conditions where spans required are more than 60 ft.

Foundations used for structures are of several types, too. Included are:

1) Piers for stream crossings and grade separations where rock or shale is available, usually founded on spread footings. The abutments are usually of the pile-bent type and are constructed monolithic with the superstructure, eliminating expansion joints at the abutments.

2) Drilled shafts, frequently used where the depth to foundation is more than 10 ft. and rock or shale is available at depths not greater than 40 ft.

3) Spread footings on piles, used where pier foundations are deep. The piles are of several types, including steel H-piles, concrete piles cased in driven shells, precast reinforced concrete piles and pretensioned, prestressed concrete piles.

Three types of railings are used on Interstate bridges:

1) Aluminum rails set on concrete walls, used on 30-ft. roadway bridges; 2) continuous concrete rails, used on full roadway bridges; and 3) on bridges carrying traffic over an Interstate route, standard concrete spindle rails without posts are used.

Construction of Interstate routes in Kansas has been in "phases". Generally, a single "phase" extends from one major city to another, or from one junction with a state or federal highway to another. Each "phase" ranges from a short distance up to 25 miles.

First contracts let on a project are for grading and bridges. Paving and seeding contracts are let when the grading and bridge projects are near completion.

"Selling" of the Interstate program to the citizens of Kansas has been no problem.

Whenever possible, sections of Interstate routes are opened to traffic soon after completion of paving and shoulders.

In other areas—especially where Interstate construction is near a present traffic route—signs have been erected pointing out Interstate construction to motorists. The signs tell the motorist that "here's something pretty special" and make him conscious of the Interstate's location and progress. They also give him an idea of what the completed Interstate system will be like when it is finished.

Kansas is looking forward to the completion of the Interstate network, and is proud of its share in the "roads of tomorrow" program.

Planned Program of Development Meets GROWING WATER NEEDS

DONALD D. HEFFELFINGER,
Engineer-Superintendent,
Department of Water and Sewage,
Alliance, Ohio

ABOUT 32,000 persons in Alliance, Ohio, use 6 million gallons of water daily. The 1940 population of 22,400 averaged $3\frac{1}{2}$ mgd. So in the last 20 years while the population has increased by one-half, water use had nearly doubled. This continued growth and industrial expansion during post-war years has required the enlarging of water facilities to meet current demands and prepare for future requirements.

In 1946 a 3-mg steel storage reservoir was constructed at a high point in the city two miles from the pumping station along with a new booster pumping station for the high service distribution system. Five miles of trunk main were installed to improve service in the industrial area of the city. In 1947 provisions for softening were made when a new chemical building was constructed at the treatment plant, one of two settling basins was equipped with sludge removal equipment and four unneeded sand filters were revamped to be used as gravity zeolite units. An unusual feature of the zeolite softening installation was the drilling of a salt brine well for use in zeolite regeneration. The well, 656 feet deep, produces 44,000 gallons of brine a day. With a concentration of 0.23 pound per gallon, the salt produced amounts to five tons daily on a dry basis.

In 1951 the main pumping station was electrified with four Fairbanks-Morse synchronous motor driven centrifugal pumps replacing three old cross-compound steam pumping engines. Ever since the water works was first built in 1882, the Mahoning River served as the source of supply, augmented at times by deep wells and a small reservoir, known as Westville Lake.

Growth of the city and increased pollution of the river made this supply unsatisfactory both as to quantity and quality. In a million dollar project in 1954 the City developed an entirely new supply on Deer Creek, northwest of the City,

with the construction of a billion gallon reservoir, low lift pumping station and three miles of 30-inch reinforced concrete pipeline to carry the water to the treatment plant.

Advance Planning

To ensure adequate facilities when they are needed and to provide for continuing and orderly growth of an expanding community, advance planning is a necessity. Alliance is located in the northeast corner of Stark County with our city limits bordering Mahoning and Columbiana Counties. Proper development of the Alliance area can be accomplished only through planning and cooperation with the three counties. An agreement covering water and sewerage has already been worked out with Stark County and is being negotiated with Mahoning and Columbiana counties in order that a master comprehensive plan for area water and sewerage can be developed. Such a plan will benefit the city through orderly development and lower unit cost of treatment.

As part of this plan the sewage treatment plant is being remodeled and enlarged and additions to the water system are being completed. The water project involved the laying of reinforcing water mains, a new standpipe and revamping of one of the older settling basins by installing mixing and sludge removal equipment.

As water use increased over the years the capacity of the mains leaving the plant reached the point

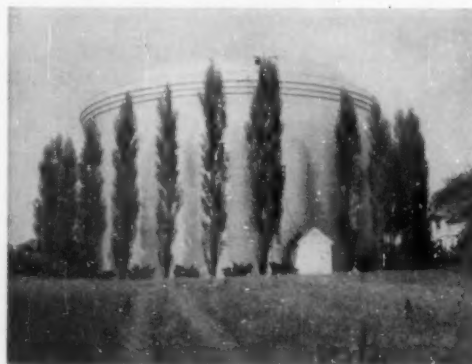
of inadequacy. During days of peak use it became impossible to supply sufficient water to keep the 3 mg reservoir at the end of the system from falling to a point dangerously low for fire protection.

A new 24-inch cast iron, cement lined main furnished by James B. Clow was laid from the plant across the Mahoning River a distance of 610 feet; and then 2000 feet of 16-inch main was built to a point in the high-use eastern industrial area where connection to a 12-inch main laid during the 1946 project was made. Eddy valves and hydrants were installed. The contractor was the North Boro Construction Company of Pittsburgh, Pa.

The project was completed this fall and has accomplished its purpose in providing adequate capacity from the plant. Now with lower pressures it is possible to maintain a higher level in the reservoir. Previously it was possible to fill the reservoir only during week ends of low use; now it can be filled during each night.

Instrumentation

With the installation of the new discharge line from the pumping station and an additional flow nozzle, a new Builders-Providence panel board was installed with flow indicators on the three discharge lines, a summation unit with totalizer and recorder, pressure and vacuum recorders, clear well depth gage and alarms. In addition, Bristol telemeters indicate and record height of water in the 3-mg reservoir two miles away, and height of



● LEFT: The 3-million gallon reservoir for the low-service district. Right: The new 96-ft. high standpipe of 0.5 million gallon capacity for the high-service area.

water in the high service district standpipes.

Most of the growth in the city is toward the southwest in an area some 200 feet higher in elevation than the pumping station, and new distribution lines must be added to the high service district. To maintain proper pressure and flow in this area and to provide for continued expansion in the future, a new half million gallon steel standpipe was constructed at the edge of the city on the highest point in the vicinity. This standpipe is 96 feet in height and 30 feet in diameter and was constructed by the Fisher Tank Company. The interior of the tank was painted with Inertol black; the exterior, Inertol aluminum. A Ross altitude valve maintains water level. Total cost of tank and foundation was \$72,830. Upon

addition of 25 percent raw water in the second basin with sludge recirculation to produce stability. However, difficulty with this method was experienced due to lack of mixing ahead of the secondary basin, short circuiting of flow through this basin and lack of sludge removal equipment.

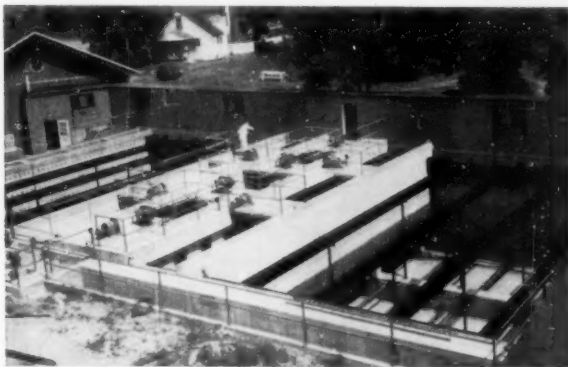
With water usage increasing each year, the point has been reached where proper settling cannot be achieved through series basin operation, and without sufficient mixing and with short circuiting, parallel basin operation would not give satisfactory treatment.

Under the present project the 60 x 100-ft. settling basin was converted into a Walker Process up-flow rectangular clarifier. Chemicals are added to the raw water at the chemical building. The water flows

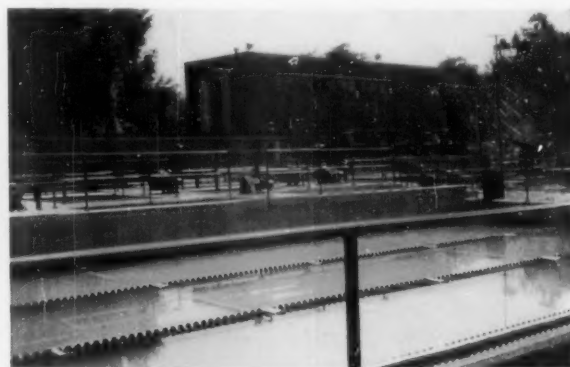
tion Company of Alliance was the contractor, and the completed cost was \$162,898.

The Chester Engineers of Pittsburgh, Pa. were the consultants on all of the water department projects mentioned in this article. This firm of sanitary engineers was employed to make a water survey in 1911, designed the original treatment in 1913, and have been engaged by the City of Alliance on many water projects since that time.

The Deer Creek Reservoir project of 1954 was financed through the issuance of \$900,000 of mortgage revenue bonds, and an additional \$485,000 mortgage revenue bonds were issued to finance the present projects. In 1949 water rates were raised for the first time in 35 years approximately 25 percent to finance the reservoir project. In 1957 an ad-



● SETTLING basin revamped; filter building in the rear; flocculation and settling compartments shown in foreground.



● BASIN in service. The chemical building is in the background; salt brine pump and derrick are at the extreme right.

completion of this new tank, the other high service standpipe and the 3-mg low service reservoir were emptied, cleaned and painted.

The third part of the present water project involved the alterations to one settling basin. In 1917, before the city was metered, the treatment plant was expanded to meet future needs. Treatment consisted of a baffled mixing chamber, settling through two basins in series, filtration through 12 one-mgd capacity sand filters and chlorination. After metering of services, water use dropped nearly one-half and considerable reserve treatment capacity existed. As a result, the two settling basins were operated in series, and when it was decided to soften the water in 1947, four of the sand filters were converted to zeolite units, and lime-zeolite softening was adopted.

An attempt was made to use split treatment, over-treating 75 percent of the water in one basin to a high pH and reducing this pH by the

through an open flume to the reaction zone in the center of the basin; then through diffusion ports to the flocculation zone and then beneath a baffle into the clarification zone; then upward to be collected in serrated weir overflow troughs. The reaction zone is equipped with four vertical shaft mixing units. Six flights of sludge scrapers sweep the sludge to the center and two screw conveyors carry it to the center drain. An automatic valve on this line withdraws sludge at timed intervals. Sludge is also recirculated to the influent flume by means of a slurry pump operated by a time clock.

New Omega dry feeders were installed in the chemical building so that chemicals to each basin and mixing chamber can be separately controlled. Provision is also made for feeding activated carbon as necessary. Manometers indicating flow in mgd will enable the operator to control the flow to the two basins. The Paul Kintz Construc-

tional 17 percent increase was made to finance the present expansion. The existing quarterly rates per cu. ft. are as follows: First 1,000, \$4.00; next 7,000, \$2.50 per thousand; next 7,000, \$2.10; next 165,000, \$1.60; over 180,000, \$1.10.

A 10 percent penalty is charged for late payments. The city is divided into three zones with one-third of the city read and billed each month. Sewer service rates are 50 percent of the quarterly water bill. Rates outside the city are 20 percent higher.

The projected water program for the future includes additional trunk mains and an additional supply reservoir by 1970; new filter units by 1975; and an additional stand-pipe by 1985. It is forecast that the area population by 1985 will be 44,000 with the average water use approximately 9 mgd. As half of the present water use in the area is by industry, future demands will depend to a large extent on area industrial development.

Tri-Fuel Engines Power New Secondary Sewage Treatment Facilities

Digester gas is automatically enriched with natural gas to regulate Btu content; diesel fuel also may be used for engines driving blowers and standby generator.

NEW secondary sewage treatment facilities recently put into operation by Toledo, O., are of the activated sludge type. Built at a cost of \$9.5 million, the addition extends the usefulness of the primary treatment plant built more than 25 years ago. Present flows from a population of about 350,000 average 50 mgd, but the design provides for complete treatment of flows up to 70 mgd.

Raw sewage enters the plant from the collecting sanitary sewage system and is lifted by pumps 30 feet so that the flow through the treatment plant is by gravity. Coarse screening removes large debris, after which chlorine may be added if needed to remove offensive odors; flow is then to the detritor building where grit and heavier materials are removed. Grit and inorganic debris are used by the city for fill

to reclaim marshes and lagoons in anticipation of the future growth of the city.

From the grit removal devices, the sewage flows to the preaeration units where compressed air is pumped into the flowing sewage for oil and grease removal. Primary sedimentation follows, with scum and solids removal. The settled sludge is pumped to the digesters. The primary effluent proceeds to the aeration plant through a long connecting channel. Here it is mixed with the activated sludge returned from the final settling tanks.

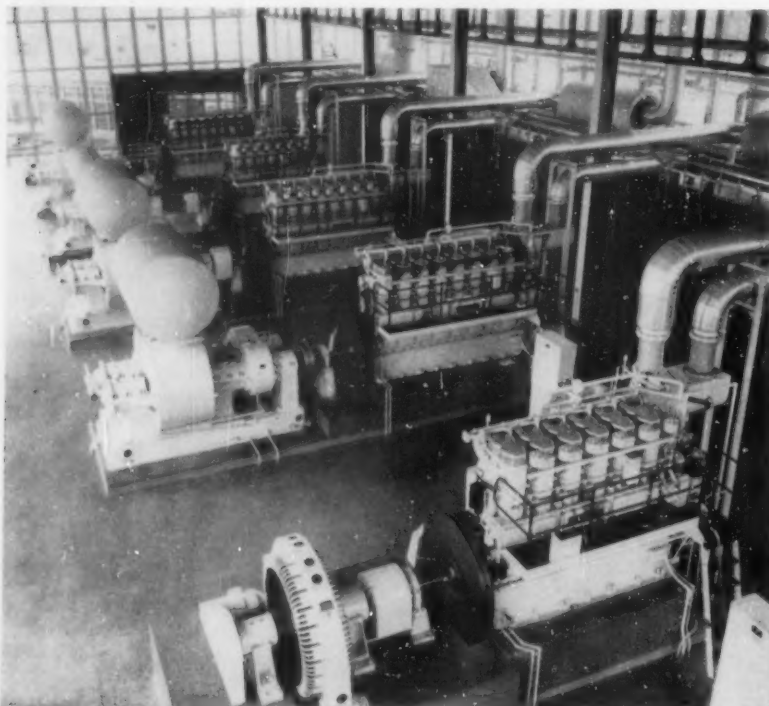
Sludge disposal is by digestion and drying on beds, with manufacture of a fertilizer called Tol-E-Grow, of which somewhat more than a thousand tons a year are sold. Gas from the digesters is drawn to a compressor and stored

in one of two spherical gas storage tanks. There are five Enterprise tri-fuel engines which operate on diesel fuel, natural gas, digester gas or a mixture. Through the means of a coloroptic unit, the btu content of the sewage gas is raised by mixing with the correct quantity of natural gas. This is accomplished automatically with a sensing device built into the coloroptic unit. Use of sludge gas for engine fuel and boiler burner fuel results in a yearly savings of \$50,000. With the engines in operation, heat normally required for the plant and the digestion process is obtained from the jacket water and waste heat mufflers.

Power for the principal equipment of the secondary facilities is provided by the five Enterprise engines and by an Electric Machinery motor. All five Enterprise engines are of the model G series, four-cycle, 12-inch bore by 15-inch stroke. Four engines drive blowers to compress the air for use in the aeration tanks. Of the four, three are usually in operation with the fourth serving as a standby and used as needed. The fifth engine drives a generator and is used for emergency power. With the fifth engine in operation the plant is virtually completely independent of outside power sources. The EM motor drives a blower which is also used for compressing air for the aeration tanks. It serves as a standby when it is necessary to shut down the engine driven blowers.

Engine number one is an Enterprise normally aspirated eight-cylinder engine, developing 425 hp at 327 rpm. It drives a Roots-Connersville 36 by 39 1/4 blower rated 20,000 cfm at 4 psi. The 4-pound air is handled by a separate system and circulated in the upper portion of the aeration tanks; 8-pound air is required at the bottom of the tanks. A separate system for the development of 4-pound air and its circulation has obvious advantages.

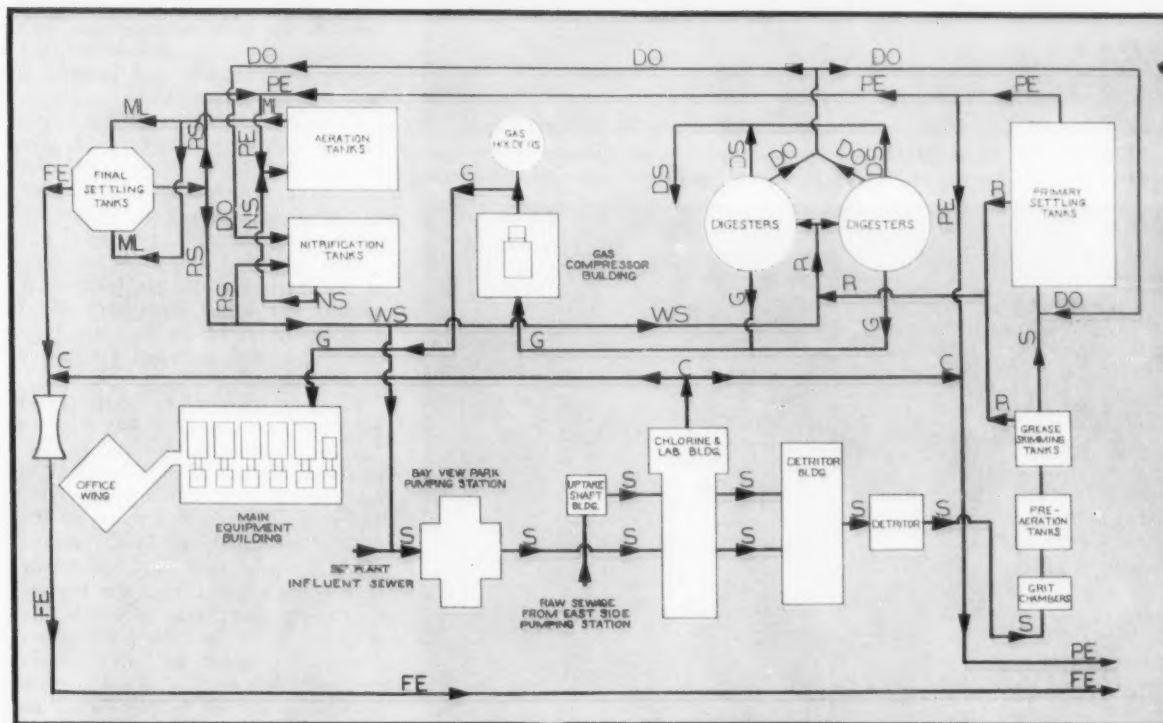
Engine number two is an Enterprise normally aspirated six-cyl-



● FOUR of the five Enterprise Tri-Fuel engines installed at the Toledo, Ohio, treatment plant drive Roots-Connersville blowers; the fifth powers a GE generator.



● AERIAL VIEW of Toledo's sewage treatment plant. Main equipment building housing the new engines is at upper right.



● FLOW DIAGRAM of sewage treatment facilities at Toledo, Ohio. Key is as follows: S, Raw Sewage; R, Raw Sludge; G, Gas; DO, Digester Overflow; DS, Digested Sludge; PE, Primary Effluent; NS, Nitrified Sludge; ML, Mixed Liquor; RS, Return Sludge; WS, Waste Sludge; FE, Final Effluent; and C, Chlorine.

inder engine, developing 438 hp at 400 rpm. It drives a Roots-Connersville 28 by 26½ blower rated 10,000 cfm at 8 psi. Engines three and four are Enterprise turbocharged eight-cylinder engines, each developing 850 hp at 327 rpm. Each drives a Roots-Connersville 36 by 39¼ blower rated at 8 psi. Engine five is an Enterprise turbocharged six-cylinder engine, developing 506 hp at 400 rpm. It drives an 80 percent power factor, 3-phase, 60-cycle, 480-volt GE generator rated 350 kw at 400 rpm. The EM motor drives a Roots-Connersville blower rated 10,000 cfm at 8 psi.

Air is drawn into the building

through two openings about four feet wide by eight feet high. A screen eliminates leaves, insects, and debris. After the screen, the air passes through fiberglass filters to collect the coarser dust particles and then through a fine oil spray bath which collects the finer particles of dust; it is finally passed over electro-static precipitators which attract even the finest of dust particles which may still remain. This precaution in filtering and cleaning the air is expected to add years of wear and trouble free operation to the blowers and engines since virtually no dust can get in to cause abrasive wear.

Fabric Cover Solves Sewage Gas Problem

By capturing offensive and corrosive hydrogen sulfide in a fabric baffle installed at the sewage treatment plant, Sarasota, Fla., engineers put an end to residents' complaints and legal actions.

A tent-like structure of specially treated "Dacron" polyester fiber covers the 10,000 square foot filtering area. This fabric, weighing 3.4 ounces a square yard, is woven close enough to trap the fumes caused by stale sewage reaching the plant.

A geodesic cover of hexagonal aluminum panels and stainless steel frames was built over the filter as armor and as a structure from which the fabric liner is suspended. The metal shields the fabric from direct rays of the sun; and the fabric, in turn, protects the metal. The liner is suspended from the metal cover at 500 suspension points by 42-in. lengths of rope made of "Dacron."

The supporting dome measures 112 feet in diameter and rises to 27 feet at the peak. The 47 separate panels weigh about seven tons. An auxiliary adjacent structure, smaller in size and pyramidal in shape, similarly uses a fabric liner and a metal support.

City officials report that since start-up, in January, 1958, there has been no air pollution problem. They consider the frame and liner economical at \$42,000, and believe it will last for many years.

Prior to installation of the fabric baffle, hydrogen sulfide odors, due to the flat sewer slopes and the high temperatures, caused a number of complaints and some litigation. The odors are still produced, but instead of going out to the air, they strike the baffle and are trapped. A suction fan draws them back down to filter level, where they are funneled into and released through a 75-foot stack.

First of its kind to be put into practical use, the unit has allowed the sewage treatment plant to discontinue the use of pre-chlorination for odor control. Savings in chemical costs are expected to repay the cost of modifications. In the meantime, the city can show positively that odors coming from the sewage treatment plant are collected and disposed of in an effective and inoffensive manner. In use for considerably more than a year, close inspection of the fabric shows no sign of degradation. A photograph of the installation and design data were published in *PUBLIC WORKS* for March, 1958.



● AERATION TANKS at Toledo. New secondary facilities are designed to give complete treatment for flows up to 70 mgd. At present the flow averages about 50 mgd.



● MAIN EQUIPMENT building of the plant presents a striking picture at night. This new building houses the engines, blowers and a generator for emergency use.

OLD and NEW PROCEDURES in WATER COAGULATION

CHRISTOPHER P. BLAKELEY,

Chemical Products Engineer,
Hagan Chemicals and Controls, Inc.

IT IS predicted that within the next 15 years water usage in the United States will increase about 75 percent. Industry and the public are demanding more water and water of more consistent quality as the years pass. New construction and expansion of present water treatment facilities will overcome the problems caused by lack of capacity. A temporary answer to these problems can be the utilization of present equipment to the fullest extent. Minor design changes often can improve clarification to such an extent that peak loads, in excess of rated capacity, can be handled without sacrifice in water quality. A thorough knowledge of the chemicals available for clarification, their functions and capabilities, and the understanding of the laboratory tools available will help plant operators to provide water of consistently good quality. The purpose of this paper is to review very briefly the action of those chemicals commonly used in clarification and softening as well as to discuss in greater detail the more recent developments in the field of aids to coagulation.

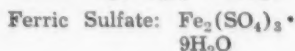
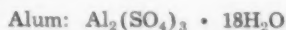
Coagulation, the removal of mud, silt, color, and other matter suspended in water depends on the capability of certain chemicals, such as aluminum and iron salts, to form floc. Coagulation is accomplished in three steps: 1) thorough mixing of chemicals and raw water; 2) slow, gentle mixing which permits floc to grow and entrap the suspended matter; 3) providing a period of quiescence while the floc settles.

This procedure is employed in conventional plants with mechanical mixing and coagulating equipment or with baffle walls. It is also the basis of upflow units, where water and chemicals are mixed in

a central section, and flow into a zone providing gentle agitation and then upward through a sludge blanket. Separation of floc and water in these units is a combination of settling and the filtering action of the sludge blanket. The solids contact units employ the same three-stage principle. Continuous recirculation of sludge into the rapid mixing zone in these units provides a seed which speeds floc formation.

Chemistry of Coagulation

The coagulants commonly used are:



On theory coagulants act in three ways: 1) A positive, trivalent ion (Al^{+++} or Fe^{+++}) is formed which will attract negatively charged colloids; 2) a negative, divalent ion (SO_4^{--}) is formed which will attract positively charged ions; and

alum with the bicarbonate alkalinity naturally present in many water supplies. In this reaction, calcium sulfate, aluminum hydroxide floc and carbon dioxide are formed. If insufficient alkalinity is present, an alkali such as lime, soda ash or caustic soda must be added.

The reaction of alum and hydrated lime is illustrated in Equation 2. Here again calcium sulfate and aluminum hydroxide are formed. The reactions that take place when water is coagulated with ferric sulfate are similar and are illustrated in Equations 3 and 4.

Ferrous sulfate (Copperas) almost invariably is used in conjunction with lime. The ferrous iron in the pH range produced by the lime is oxidized to ferric iron and the subsequent reaction is the same as given in Equation 4. Prechlorination may be used in place of lime where sufficient alkalinity is present or in combination with lime since chlorine supplies the oxygen necessary to oxidize ferrous iron to ferric iron. Chlorinated copperas, a chlorinated

Chemical Equations Significant in Coagulation

- $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O} + 3\text{Ca}(\text{HCO}_3)_2 = 3\text{CaSO}_4 + 2\text{Al}(\text{OH})_3 + 6\text{CO}_2 + 18\text{H}_2\text{O}$
- $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O} + 3\text{Ca}(\text{OH})_2 = 3\text{CaSO}_4 + 2\text{Al}(\text{OH})_3 + 18\text{H}_2\text{O}$
- $\text{Fe}_2(\text{SO}_4)_3 \cdot 9\text{H}_2\text{O} + 3\text{Ca}(\text{HCO}_3)_2 = 3\text{CaSO}_4 + 2\text{Fe}(\text{OH})_3 + 6\text{CO}_2 + 9\text{H}_2\text{O}$
- $\text{Fe}_2(\text{SO}_4)_3 \cdot 9\text{H}_2\text{O} + 3\text{Ca}(\text{OH})_2 = 3\text{CaSO}_4 + 2\text{Fe}(\text{OH})_3 + 9\text{H}_2\text{O}$
- (a) $\text{Ca}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 = 2\text{CaCO}_3 + 2\text{H}_2\text{O}$
(b) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 = \text{MgCO}_3 + \text{CaCO}_3 + 2\text{H}_2\text{O}$
- $\text{MgCO}_3 + \text{Ca}(\text{OH})_2 = \text{Mg}(\text{OH})_2 + \text{CaCO}_3$
- $\text{MgSO}_4 + \text{Ca}(\text{OH})_2 = \text{Mg}(\text{OH})_2 + \text{CaSO}_4$
- $\text{CaSO}_4 + \text{Na}_2\text{CO}_3 = \text{CaCO}_3 + \text{Na}_2\text{SO}_4$

3) a hydrate precipitate [$\text{Al}(\text{OH})_3$ or $\text{Fe}(\text{OH})_3$] is formed which will remove suspended matter by entanglement and adsorption.

Alkalinity in the water is necessary to produce this hydroxide floc as will be seen in Equation 1. This equation illustrates the reaction of

ferrous sulfate, occasionally is used as a coagulant in soft, colored waters. In this application usually one part of chlorine and eight parts of ferrous sulfate are mixed. This material is usually best applied at a pH below 7. It is believed that here coagulation at the low pH is due

to the formation of complex ferric organic precipitates.

Since coagulants require the presence of sufficient quantities of alkali for complete reaction, it is obvious that the natural alkalinity of the water must be determined in the laboratory. Where alkali must be added to achieve coagulation, pH control is extremely important for good flocculation. This, with other analytical control procedures, will be discussed later.

Chemistry of Softening

The equipment used in cold process softening is the same as that for straight clarification. The chemicals used are hydrated lime, $\text{Ca}(\text{OH})_2$; burned lime, CaO ; soda ash, Na_2CO_3 ; or sodium aluminate, NaAlO_2 .

The lime reacts with the bicarbonates of calcium and magnesium to form their carbonates as illustrated in Equation 5 (a) and (b). In this equation hydrated lime reacts with calcium bicarbonate to form calcium carbonate. Under conditions normally maintained only 20 to 30 mg/L of calcium carbonate are soluble. The balance will precipitate. Lime also reacts with magnesium carbonate to form the flocculent hydroxide and calcium carbonate (Equation b).

Magnesium sulfate will react with lime to form magnesium hydroxide and calcium sulfate (Equation 7). Where the raw water contains appreciable amounts of magnesium compounds, the magnesium hydroxide formed in these reactions, being bulky and flocculent, sometimes provides good clarification without further addition of a coagulant. Where appreciable amounts of noncarbonate hardness are present in addition to the carbonate hardness a treatment with lime and soda ash may be necessary. In Equation 8 we have used calcium sulfate as the noncarbonate hardness, illustrating the reaction that takes place with soda ash to form calcium carbonate and sodium sulfate. In softening plants where aluminum or iron salts are used as coagulants, these will react with lime forming the respective hydroxide floc and calcium sulfate. The calcium sulfate reacts with the soda ash as shown in Equation 8. This is an instantaneous reaction which, for convenience, we consider as occurring in two stages.

Sodium aluminate is sometimes used as a coagulant in the softening process. It will hydrolyze to form caustic soda and aluminum hy-

droxide. Commercial sodium aluminate contains some free caustic soda thus replacing both lime and soda ash in amounts equivalent to the caustic originally present and that formed by hydrolysis.

Stabilizing Softened Water

Water softened by lime treatment is not stable, but is supersaturated, particularly with calcium carbonate. This water, going to the filters, will produce sand grain growth due to deposition of the crystalline carbonate on the sand. Distribution systems become encrusted; domestic hot water systems will scale rapidly and meter maintenance will be increased.

Recarbonation of the settled water is a partial answer to this problem. By bubbling carbon dioxide gas through settled water, the normal carbonates are converted to bicarbonates and the water is stabilized against precipitation of calcium carbonate. Theoretically, recarbonation should leave the water free from calcium carbonate precipitate. It is common practice, however, to provide additional settling as some extremely finely divided precipitate may remain. It may often prove beneficial to add small amounts of coagulants, or coagulant aids to help agglomerate these particles and settle them out. This process is fully described by Hoover (1). Where this is impractical or where no recarbonation equipment is available, treatment of the water going to the filters with 1 to 2 mg/L of sodium hexametaphosphate is commonly accepted practice (2).

Aids to Coagulation

In recent years the term "polyelectrolyte" has often been used to describe various materials that are both polymers and electrolytes. This term is somewhat misleading when applied to chemicals available as aids to coagulation because many of the materials are mixtures, including some natural or synthetic organic polymer. In this discussion the term "polyelectrolyte" is used to describe only the polymer. The term "coagulant aid" is used when referring to compounded materials.

Activated silica, first used by Baylis (3), is perhaps the most widely known coagulant aid. It is prepared by partially neutralizing a dilute solution of sodium silicate with acid or an acid reacting salt or gas. This produces minute colloidal silica particles, called micelles, which grow during an aging period. Once proper micelle size is reached,

further dilution arrests micelle growth and prevents jelling. Very close control of the aging period is essential. Automatic equipment for the preparation of activated silica sols is available from various manufacturers.

While activated silica is often regarded as the earliest developed aid to coagulation, natural polyelectrolytes actually were known and used as flocculent materials as long as four thousand years ago. Much research has been done in recent years on the use of high molecular weight natural and synthetic organic polyelectrolytes. Very little has been published—perhaps because the chemical reactions that take place are not fully understood. It is believed that the polyelectrolytes are adsorbed onto suspended solids, extending tails or bridges. When, in the coagulation process, two or more such particles approach one another, these bridges bind particles together and rapid coagulation occurs. The theory of binding was first advanced by Langelier and Ludwig (4) for alum flocs. It is possible that polyelectrolytes, due to their structure, are more powerful binders and, therefore, react in that manner. It is hoped that present research work, including electrophoretic studies such as those reported by Pilipovich, Black, Eidness, and Sterns (5), will shed additional light on the phenomenon of coagulation in general and the action of polyelectrolytes in particular.

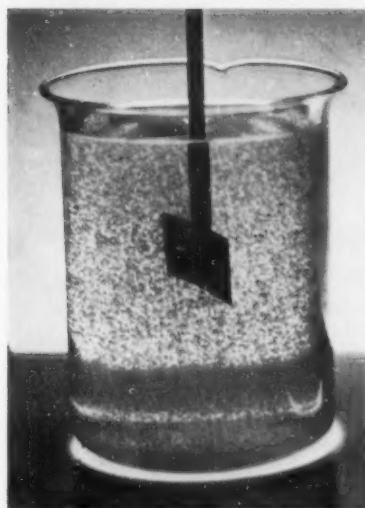
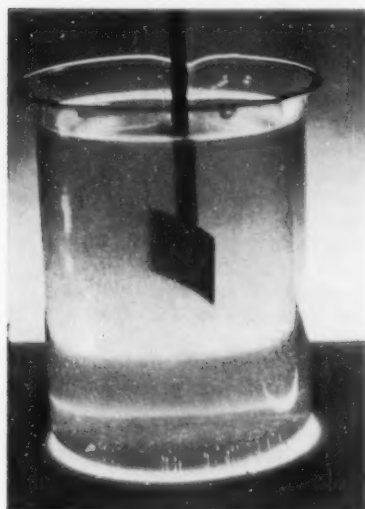
Reducing complicated colloid chemistry to simple assumptions, the function of a polyelectrolyte can be regarded simply as that of a binder. The coagulant reacts as demonstrated by the chemical equations. The polyelectrolyte is introduced at a point where flocculation first occurs. It "coats" the floc particles. When two or more of these collide in the coagulation process, they adhere. Thus floc growth is speeded up and, as the floc travels through the water, it entraps suspended matter. Therefore, a floc presenting a large surface area is exposed to the turbidity in the water for a longer period of time. The end result can be compared to enlarging the coagulation basin.

Effect on Floc Characteristics

The property of coagulant aids to increase the speed of floc formation is of value where clarification equipment must be operated in excess of its rated capacity. It may also be of help when, in winter, low water

temperatures slow all chemical reactions and floc formation.

One large floc particle is apt to be heavier than two or three smaller particles. Therefore, more often than not, the settling rate of a polyelectrolyte treated floc is faster than that of a coagulant floc. However, this is not always the case. Waters low in turbidity may not provide sufficient weighting agent to lend enough weight to the floc. Also, in some instances, the coagulation process may release gases from water causing floc particles to float or, at least, to prevent them from settling. To overcome these problems, some polyelectrolytes are compounded with specially processed clays. These coagulant aids act in three ways. The clay serves



● RATE of floc formation is faster when coagulant aids are used, as shown by the comparison of the suspension in the lower beaker containing an aid and that of the upper, with coagulant alone.

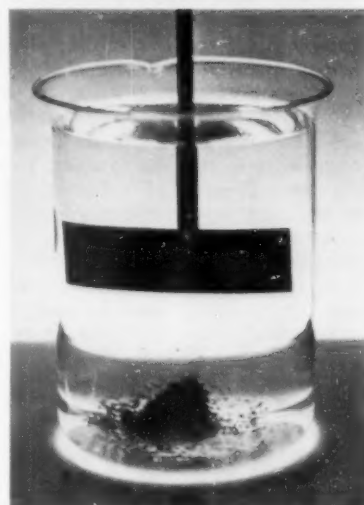
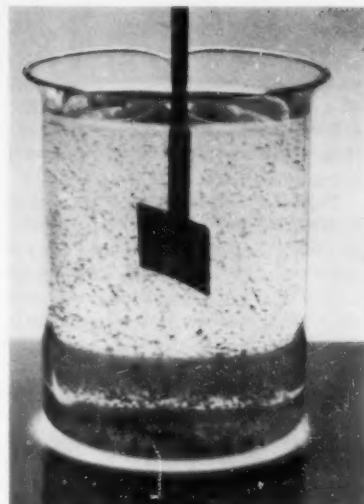
as a nucleus for floc formation. The polyelectrolyte acts as the binder and the clay, again, provides the weight necessary for rapid settling.

The increase in the speed of settling due to the action of a coagulant aid can be of benefit to plants deficient in sedimentation capacity. The increased weight of the floc is important in winter where settling basins are enclosed and the buildings heated. The increase in temperature on the surface of the water sets up upward eddies which will carry floc particles to the surface and onto the filters. The sun's heat will produce similar effects in unprotected clarification facilities.

Upflow units, also, can benefit from the added weight imparted to floc by a coagulant aid. Water plants usually are unable to make load variations gradually. When demand increases, another pump is put in service. This suddenly increases the velocity of water through the various stages of the unit, tending to lift the sludge blanket. If the change is violent enough, floc carryover will result until equilibrium at the new throughput rate is reached.

Solids contact units draw previously formed floc into the rapid mix zone. The agitation in that zone may be enough to break up the floc. Unless that floc is tough enough to withstand the agitation encountered there or is capable of reforming once broken up, recirculation of sludge may result in higher effluent turbidities than would normally be expected. Coagulant aids, due to the binding action of the polyelectrolyte, normally produced a tougher floc more resistant to agitation. But even if floc is broken up, the continuous addition of treatment chemicals including a coagulant aid will reform the floc readily. It is believed that it is necessary only to add 1/10 of the original dosage of a coagulant aid to reform a floc. The normal coagulant aid dosage will, in most cases, provide sufficient excess.

It must be recognized that polyelectrolytes cannot, except in rare instances, economically replace the metal coagulants. Where a raw water contains enough dissolved iron or aluminum so that, in effect, it provides its own coagulant, the use of a coagulant aid alone may adequately and economically clarify that water. Where waters high in iron are aerated and the iron precipitated in the ferric form, a similar situation exists. It must be remembered, however, that good mixing of the coagulant aid, fol-



● FLOC formed in the beaker in the upper photo is easily broken upon re-agitation, but it will retain settling characteristics if an aid is used as shown in the beaker in the lower photo.

lowed by coagulation and sedimentation, is necessary to agglomerate and settle the precipitate. To aerate iron bearing water and treat it with a coagulant aid and filter it without, at least, the most rudimentary coagulation and sedimentation equipment may create serious problems in the filters. The binding action of the polyelectrolyte is not confined to metal coagulant floc. It may also bind sand grains creating a relatively impervious mat on the filters. However, the rapid promotion of floc growth by coagulant aids does permit the use of very simple and inexpensive clarification equipment.

An attempt has been made to explain why coagulant aids can overcome many of the temporary as

well as the continuous problems of water plants. Their use in many water plants during the last four years shows that they increase speed of floc formation, floc growth, and settling rate. Experience also shows that coagulant aids can help overcome color problems.

Color is almost always present as a negatively charged colloid. It was formerly believed necessary to reduce the pH to provide more positively charged ions. Color removal was accomplished by using alum in the approximate pH range from 5 to 6.2. Often it is not desirable to reduce the pH to this level because at 6.5 aluminum will begin to dissolve, creating problems in the distribution system and beyond, at points where the water is used. Normally such waters are adjusted in pH with an alkali prior to distribution and some after-precipitation of aluminum hydroxide in the lines can be expected. Also, where such water is used as boiler make-up, a complex scale, sodium aluminum silicate, may be formed. The economic benefits of reducing pH to such low levels with alum alone or by addition of acid also are questionable. Coagulant aids, particularly compounds of polyelectrolytes and clays, have been helpful in overcoming color problems at reduced coagulant feed rates. This, perhaps, is due to the adsorptive power of the clays coupled with the established fact of faster floc formation and growth. Longer exposure of the colloid to a well-defined floc may well be doing now what previously was strictly a function of pH.

Turbidity and pH

Water plants using coagulant aids find that the action of polyelectrolytes is not markedly influenced by pH or turbidity variations. Prior to the advent of these aids, floc characteristics were attributed to many variables including accurate balance between alkalinity and coagulant. As the polyelectrolyte will adsorb on pin-point floc and promote satisfactory floc growth even under conditions where all the known and unknown factors are not in balance, the effects of sudden changes in raw water turbidity or pH are minimized. Usually it is not necessary to make changes in treatment dosages.

Selecting Coagulant Aids

Most polyelectrolytes are flocculants in their own right. It is reasonable, then, to expect that the use of a coagulant aid will reduce

the coagulant requirements. It is not possible to predict how much. Nevertheless, experience with many waters and in many water plants of varying sizes and designs indicates that it is usually possible to reduce the coagulant to such an extent that the treatment cost is not increased by the use of the coagulant aid. Some plants report substantial savings in chemicals and labor costs.

There are probably upward of 30 coagulant aids on the market today and new materials are being added regularly. Where water is treated for drinking purposes, toxicity of the aid must be considered. A committee established by the United States Public Health Service evaluates coagulant aids from the toxicity standpoint. A listing of the materials this committee has approved is available from State Health Departments.

The desirable floc characteristics for conventional sedimentation basins are entirely different from those of an upflow unit. In the conventional basin, speed of floc formation and the settleability of floc are of paramount importance. Whether the floc is fragile or tenacious, big or little makes little difference.

In an upflow unit, weight and size of floc are very important as floc-bearing water flows upward through a blanket of previously formed floc. Unless the blanket is fairly dense and heavy, the upflow may well disturb the blanket and floc particles will not be effectively removed

in their upward passage.

Solids contact clarifiers are up-flow units where coagulation takes place in the presence of previously formed floc. Initial rapid formation of floc is of minor importance. The floc in this type of unit, however, must also be tenacious in order to withstand recirculation. It must reform well after being broken up.

These points should be considered prior to laboratory evaluation of coagulant aids and a check list prepared which sets forth the improvement the water plant expects from a coagulant aid and the problems the aid must overcome. The jar test, accurately used as described later, will provide the preliminary data to be confirmed in actual plant application of the coagulant aid selected.

Feeding of Coagulant Aids

Dosages of coagulant aids range from a low of 0.25 mg/L or less to a high of perhaps 8 or 10 mg/L.

Some aids, especially those compounded with clay, can be conveniently applied by conventional dry feed machines. Also, vibratory dry feeders capable of accurate delivery of very small amounts of freeflowing materials are available at reasonable costs. Where it is impossible or impractical to feed extremely small quantities from existing dry feeders, these materials can be readily prepared into slurries or solutions using a tank and rapid mixer. Some coagulant aids on the market today are supplied in liquid



● METHOD of applying coagulant aids depends on the material used and may be by dry feed machines or by slurry. Dosages required range from 0.25 to 8 or 10 mg/L.

form and can be applied directly from the shipping container. To insure accurate dosage control and good distribution of the aid, it is usually good practice to dilute these materials prior to application. A few of the coagulant aids present some difficulty in preparation of feed solutions and the manufacturers have developed feed equipment ideally suited to their materials. This equipment is usually available at a nominal cost.

Standard Methods (9) lists the recommended procedures and reagents for performing the necessary analytical work. Cosens (8) explains the chemistry involved in the routine tests a water plant normally performs.

One of the most important yet most abused and most neglected tools available to the water plant chemist is the jar test. Black, *et al* (6), noted that, as far back as 1898 and perhaps earlier, laboratory studies were made using hand agitation in an effort to duplicate conditions in a water plant. Since then variable speed mechanical equipment permitting simultaneous evaluation of up to 6 samples at one time has become commercially available. Cohen (7) recently reported further refinements in the jar test technique.

The Jar Test. As in all analytical work, cleanliness of glassware and stirring equipment is important. This is especially true when evaluating coagulant aids, as many polyelectrolytes will coat glassware and the results of subsequent tests may be misleading. Also, it is essential that water samples be accurately measured, additions made carefully, and reagents made with the same chemicals used in the plant.

Temperature control is important. Chemical reactions in cold water are slower than in warm water. If the raw water sample is brought into the plant laboratory and permitted there to attain room temperature before being tested, erroneous results are certain. A water bath into which the sample beakers are placed is easily constructed and will go a long way toward providing uniform temperature.

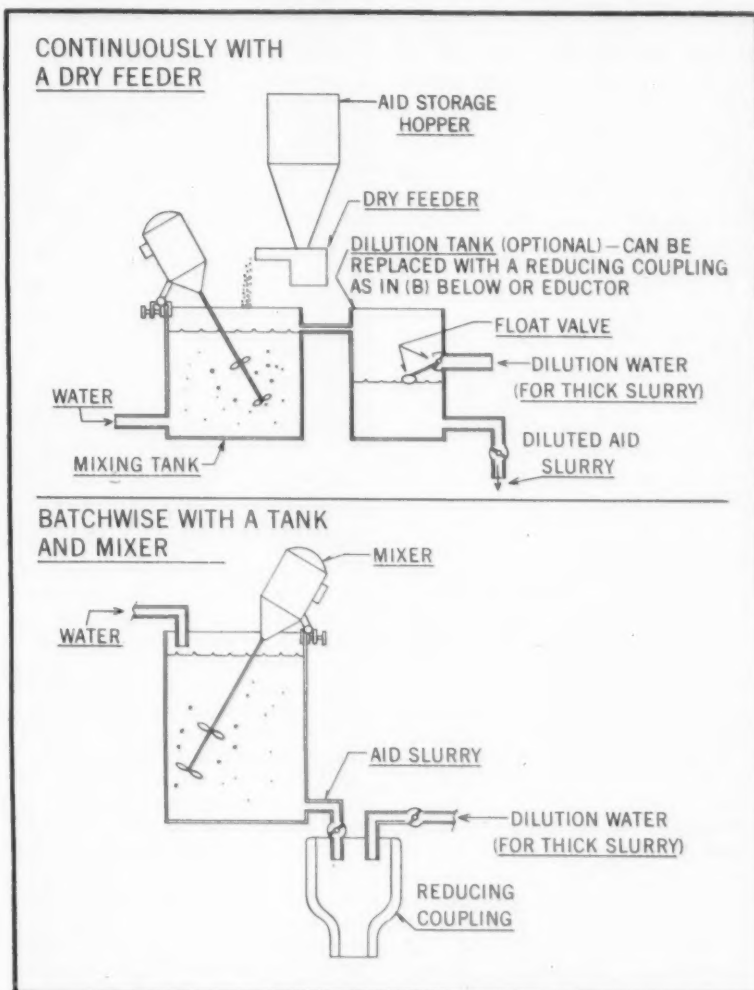
Water samples should be tested as soon as possible after collection. Since almost all water plants use the three steps of rapid mix, coagulation, and settling, it is essential to duplicate these as closely as possible in the laboratory by varying the speed of agitation over definite time periods. A good starting point is to stir at 100 rpm for 3 minutes.

This represents passage of water through the rapid mix zone. This is followed by a mixing period of 5 minutes at 50 rpm representing passage of water through the coagulating section. Water then enters the quiescent zone. There is, however, enough velocity to create gentle agitation in the initial stages of the sedimentation basin. This is duplicated by stirring for 10 minutes at 20 rpm. As mentioned previously, these time and speed sequences are a good starting point. By visual comparison of floc characteristics in the plant at various stages, the plant chemist can adjust time and speed sequences in the jar test procedure to duplicate actual plant performance with a great degree of accuracy. This should be done for normal operating conditions as well as for recurring abnormal conditions such as throughput rates in excess of the norm. Once these time and speed sequences have been

established to reproduce conditions in the plant, it is possible to predict with accuracy the results of changes in chemicals, dosages, and the use of coagulant aids.

Where a solids contact unit is involved, recirculation of sludge in the jar test is easily duplicated. Using the time and speed sequences previously established, the first series of jars is mixed and coagulated in the normal manner and floc permitted to settle. The supernatant is then carefully decanted and sludge retained in the jar. The same volume of freshly collected raw water is then added to the jars. Jars are treated identically to the previous run and coagulation repeated. While the volume of sludge recycled in jar tests bears no relation to the actual volume recycled in the clarifier, experience shows that this technique gives good correlation of conditions.

(Continued on page 164)



● SCHEMATIC diagram illustrates continuous dry feeding with conventional or vibratory machine and (below) use of batch mixing with a tank and high-speed mixer.

90 YEARS OF PLANNING

B. H. CRUCE,
City Manager,
Greeley, Colo.

PLANNING of Greeley, Colorado, started in the publisher's office of "The New York Tribune" some 90 years ago. When Horace Greeley, publisher of the Tribune, said "Go west, young man, go west," he had Greeley, Colorado, in mind. It was here that he had a moral and financial investment in the West. Greeley was colonized by a group of Eastern people who had been brought together by advertisements in the Tribune under the leadership of Horace Greeley and Nathan C. Meeker, agricultural editor of the paper.

The entire colony was planned, containing over 70,000 acres, with the village centrally located. Funds obtained from the sale of village lots were "to be used for the common good—such as the building of a church, a town hall, a school house, a library, by which means the lots will be worth five or ten times more than their cost," so said a circular proposing the colony in 1869.

The members of the colony began to arrive during the spring of 1871 and on May 29, 1871, it was officially incorporated and named Greeley. Greeley is located midway between Denver, Colorado, and Cheyenne, Wyoming, on the Cache LaPoudre River.

The early planners decided that all village streets would be 100 ft. wide and all rural roads 60 ft. wide. This was in 1869, long before automobile and truck traffic became the nation's number one headache.

The village was laid out on a grid pattern with 20-ft. alleys crossing the center of each block, except for the blocks designed for the business district which had an additional T-alley 16 ft. wide. All blocks were designed 400 ft. square except two tiers of lots through the center of the village which were only 250 ft. one way and 400 ft. the other. Business lots were made 50 ft. wide and a quarter of a block was considered necessary for residential needs.

The first planners gave the City three parks, two of which are still

in existence. One park was vacated and sold to the railroad for a depot location. One park of two city blocks is adjacent to the downtown business district and has a community center constructed on three sides. The City Hall and Library is on one side, the Court House and Elks Lodge on one side, a church and community auditorium on one side, and the business district on the fourth side. The park is the pride of the City and serves as a restful "green" in its center.

Early planners also provided a park for residential purposes which still serves as a playground and picnic area.

As the village grew into a city, later planners secured 55 acres on the river bank for park purposes. This park has been developed into the county fair grounds, rodeo arena, picnic grounds, municipal zoo and for other park purposes. Other parks were secured from time to time until today Greeley's 25,000 population enjoy about 200 acres of park areas.

In 1906, the first water filtration plant was built 38 miles away in the foothills of the Rockies with one 16-in. wooden transmission main to the city. This plant has been enlarged several times and a 6 mgd addition is being constructed now. The last of the wooden water main has been replaced and now three steel lines 20, 27 and 30-in., bring 20 mgd of melted snow from the Rockies into Greeley.

From time to time water rights were secured until today it is esti-

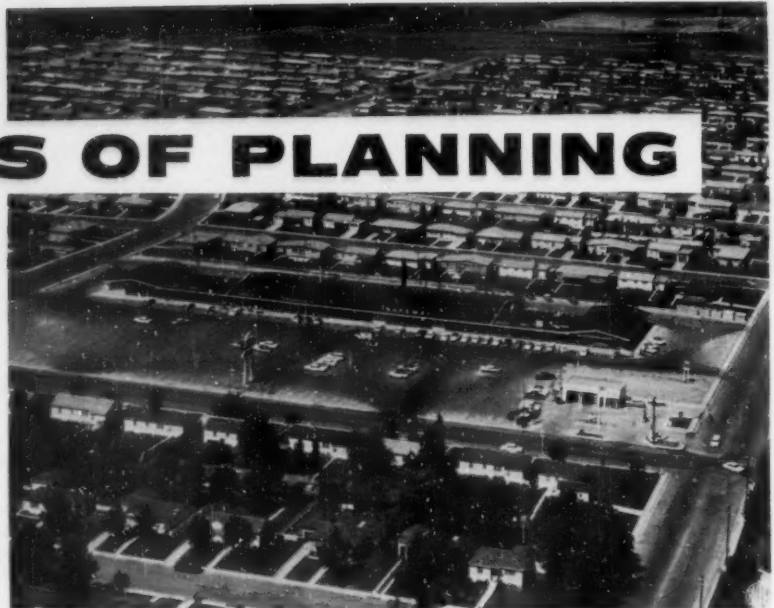
mated that Greeley's present water supply could support a 100,000 population.

Even though there was no official planning agency, additions to the city prior to 1940 followed a rectilinear street pattern. The first organic subdivision with curved streets, cul-de-sacs, and irregular set backs was started in the mid 1940's. This subdivision is on the high point of the city but its streets do not follow the topography of the land. It was, however, planned as a high class residential subdivision, with park, streets which eliminate through traffic, utility easements instead of alleys, well drained and paved streets. This subdivision contains our most expensive homes.

Planning Commission

In 1954, the first Planning Commission was established, and it immediately employed Walter McC. Maitland, Drake, Colorado, as planning consultant to begin the preparation of a Comprehensive Master Plan for the city. The first projects consisted of subdivision regulations, a thoroughfare plan extending beyond the city limits, and review of the zoning ordinance.

The zoning ordinance had been adopted in 1928, and with the exception of zoning district changes, it had been amended only once in the 30 years of its existence. The ordinance was completely re-written and instead of listing every possible name of a business or industry, the



● CLOSE-UP view of a part of the subdivision mentioned on page 118. The shopping center is shown in the foreground; at the left is part of the neighborhood park.

types and classes of merchandise handled were listed as recommended in the NIMLO Model Zoning Ordinance.

Forty-eight changes in the zones were recommended and the council approved 44. In printing the ordinance for public distribution, 32 illustrations were drawn to make the more technical requirements easily understood. These illustrations have been very helpful in the administration of the ordinance.

The City Manager, the Mayor and one member of the Council also served on the first Planning Commission.

At the request of the Council, the Planning Commission appointed a parking committee of three commission members and five businessmen. Under the leadership of this committee, a complete parking study was made. Upon recommendation of the committee, the city leased with

special fund for acquisition and development of off-street parking lots.

The City has contracted with the County for two parking lots on County property near the downtown business district. These lots will accommodate about 120 cars when developed and will be partially metered.

In 1956, a land use and population study was made and the growth of Greeley projected to 1980. According to Mr. Maitland's report, the following facts appear:

The residential uses of the City are not only confined to residential zones but also appear throughout the commercial and industrial zones. Of the total area, 41.9 percent is devoted to residential uses. This amounts to 45.3 percent of the developed area which appears to be above the average for most American cities. This is due largely to Greeley being a residential com-

house about 18 percent of the population. The average is about 8 percent. The Colorado State College students and teachers probably account for this high percentage.

About 70 percent of the properties within the business zones are actually used for business purposes. In the Central Business Zone, only about 25 percent of the property is actually used for business.

Industrial zones account for 3.6 percent of the total city property. Most of the industry is located along the two railroads with 60 percent classified as light industry and 40 percent classified as heavy industry.

The city population is estimated to be 50,000 in 1980. Because of Colorado's annexation laws a large number of people who live just outside the city limits now are being served by city water and sewer services.

The Greater Greeley Area is estimated to contain a population of 70,000 by 1980.

The study was also the beginning of a plan for community facilities. An economic study was made by Hoper and Associates, consulting engineers, and this report has been used in the preparation of other phases of the Comprehensive Master Plan as well as by other agencies of the city.

Sewage Treatment

A sewage treatment plant was constructed for 35,000 population while trunk lines constructed were designed to handle a population of 70,000. The area that can now be served by the sanitary sewer system is twice the present area of Greeley.

During the past three years, a base map of Greeley and vicinity has been prepared and the city is obtaining topographic maps of the fringe area as funds are available.

An ordinance providing for a uniform system of street naming and house numbering was adopted January 24, 1958. Street name signs with the block numbers have been erected at each intersection as well as several hundred traffic signs. The total cost of the two projects exceeded \$10,000 for labor and materials.

A five-year street reconstruction program has been in progress four years with over \$500,000 spent to date.

Greeley adopted a Home Rule Charter June 24, 1958, and the Charter prohibited members of the council or administrative officers from serving on the Planning Commission. The Commission therefore was



● OVERALL view of the subdivision. The shopping center is in the middle of the picture; also shown is the neighborhood park and left of this is the swimming pool.

option to purchase two downtown parking lots of 60 spaces each. These lots were improved and metered at 5¢ for two hours. The purchase price of each lot is about \$1,250 a car space.

Three tracts owned by the city were also improved as parking lots but since they were not close to the retail area for shoppers these lots were not metered and are used by employees for all day parking. Thus approximately 300 off-street parking spaces were developed.

A long range program for municipal parking lots was planned, and 25 percent of the parking meter revenue is now deposited into a

munity of large lots and low densities.

Only 76.8 percent of the total residential zones is occupied by single family dwellings, which house 58 percent of the population. The average for most cities is 90 percent.

A total of 16.3 percent of the residential zones is devoted to two-family dwellings. This compares with a use of between 2 and 8 percent for the average city. This type of dwelling houses approximately 24 percent of Greeley population compared to an average of 10 percent for most cities.

Multiple family dwellings use 6.9 percent of the residential zones and

reorganized and all but one is a new member.

Trafton Bean and Associates were employed as planning consultants and were requested to prepare a summary of past plans, prepare some publicity material and review the community facilities projects included in the Comprehensive Master Plan. Future parks and playgrounds, the airport master development

planned recently contains 160 acres. It has a well designed shopping center with plenty of parking, seven-acre park and playground, streets improved with asphalt paving, curbs, gutters, sidewalks and storm sewers. All this, plus water and sewer laterals were paid for by the subdivider. The subdivider also spent \$25,000 improving the park which was donated to the city. The park is cen-

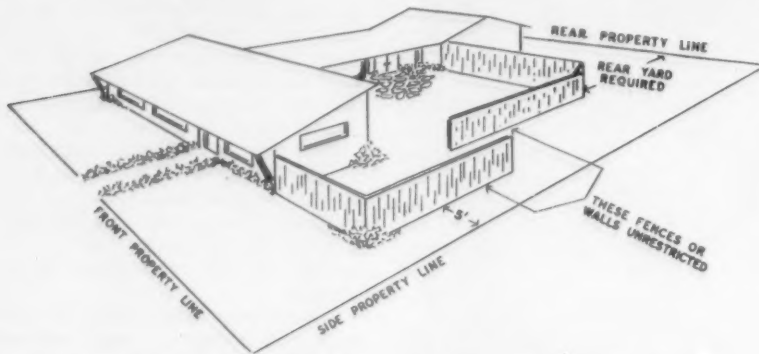
swimming pool constructed for the benefit of members only.

The shopping center is well located at the intersection of two major streets which are paved 52 ft. from curb to curb.

The land in this subdivision was leveled where necessary in order to keep the streets in close conformity to the existing street pattern. It has a rectilinear street pattern. A new school was recently constructed to take care of the increased population.

In April of this year, a report was made to the Council and Planning Commission of problems being encountered in administering the building and zoning codes. Greeley adopted the Uniform Building Code in 1955 and W. E. Coffey, an architectural engineer, was employed in 1958 as chief building and zoning inspector. It was due to his efforts to enforce impartially both codes as written that caused the problems to show up.

The City Council authorized the City Manager and City Attorney to work with others in trying to de-



● IN A one-family dwelling district, fences, walls and retaining walls, or combinations of them, may not exceed 6 ft. in height. Approved arrangements are shown.

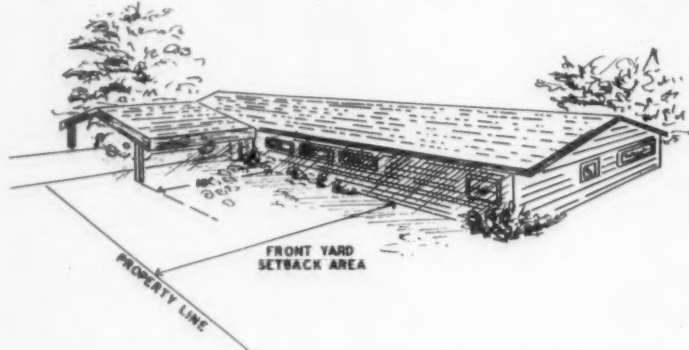
plan, a museum and city service center are among the projects being currently studied.

In 1957, the Council increased the fees for building permits and the increase is deposited in a special fund for acquisition and improvement of future parks. About \$10,000 a year, at the present rate of growth, will be realized from this fund. The Planning Commission and Council preferred this method to the requirement that the subdivider dedicate a percent of land for parks. The city can purchase the park site wherever needed for a large area rather than have many small parks or playgrounds that are hard to maintain and which may not serve the area properly. The city owns approximately 40 acres at the airport which is available for shops, hangars and an industrial area, all of which is being planned.

A proposed museum has been designed and a new shop constructed with a central store and warehouse planned. All land for these facilities have been acquired. A police and courts building is also proposed and land acquired for the location.

Six wall maps are being prepared by the City Engineering Department under the supervision of the planning consultant. These maps are 40 in. x 60 in., mounted in aluminum frames. They consist of zoning, land use, utilities, proposed land use, community facilities and drainage.

One of the better subdivisions



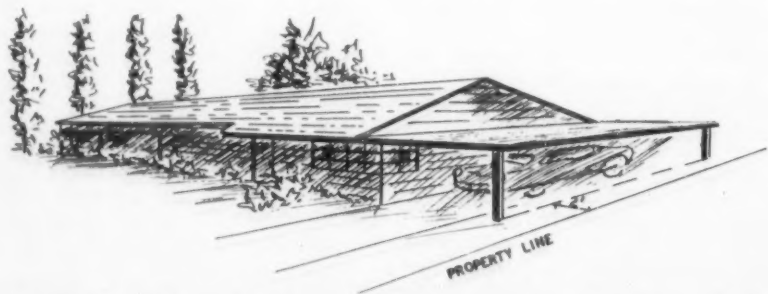
● SETBACK and methods of measuring are detailed in the Zoning Code.

trally located on choice land, well drained, bounded on two sides by streets with a six-foot chain link fence between it and the adjoining property on the other two sides.

A non-profit swimming pool club has been organized and a \$50,000

velop a zoning code that would have better correlation with the building code.

The City Engineer, Mervil L. Miller, Jr., Mr. Coffey and myself immediately began a careful study of both codes. After several meetings



● UNENCLOSED carports may extend into front yard 10 ft. or into side yard 3 ft.

on technical problems the City Attorney, Tom Richardson, was called in to work on the legal procedures of zoning.

We followed as closely as possible the occupancies listed in the Uniform Building Code and added those uses and occupancies not necessarily needing a building. A total of 32 use groups and seven general occupancy groups were developed with performance standards as the guide. The general occupancies are agricultural, residential, assembly, institutional, business, industrial and special. We also deviated from the old idea of allowing every use and occupancy permitted in the more restricted zone to be permitted in the lesser restricted zone.

The various use zones will correlate with the fire zones, for instance, B-1 Business Zone and M-1 Industrial Zone will coincide with Fire Zone No. 1; B-2 Business Zone and M-2 Industrial Zone will coincide with Fire Zone No. 2; B-3 Business Zone and M-3 Industrial Zone and all "R" Residential Zones will coincide with Fire Zone No. 3.

This we believe will not only materially aid in the administration of the building and zoning codes but also will aid the general public in determining the occupancies and building requirements of the various zones.

Included in the new ordinance will be a Transient Residential Zone which will permit trailer courts and

some other business. Off-street parking will be required in all zones except the "B-1" Central Business Zone.

Each petition for a change of zoning must be on the approved form and be accompanied by a report from the Planning Commission before a public hearing is held by the Council. Only four public hearings a year are held, on the second Tuesday of March, June, September and December.

Each petition for subdivision approval must also be submitted on a special form and accompanied with a vicinity sketch. The forms are reproduced and sent to the Planning Commission members seven days before the meeting.

Cutting Municipal Power Costs

SINCE installation in 1957, two 1600-hp Nordberg Duafuel diesels have generated more than 90 percent of total plant output and effected substantial savings in production costs, for the municipal power plant at Tulia, Texas. The performance of the new engines reduced plant fuel cost nearly a mill to 2.86 mills per kwh. Additional savings on lube maintenance and supplies cut another mill, bringing total operating cost down to 5.6 mills per kwh.

Tulia, a community of 4,600 population in the Texas panhandle, constructed an electric power plant in 1911 and the first 80-kilowatt steam engine was installed that year. The modern plant had its beginning in 1923 with the installation of two

100-horsepower internal combustion engines. By 1953, the plant had five engines with combined capacity of 3,890 hp. Three of the units burned natural gas fuel and pilot oil.

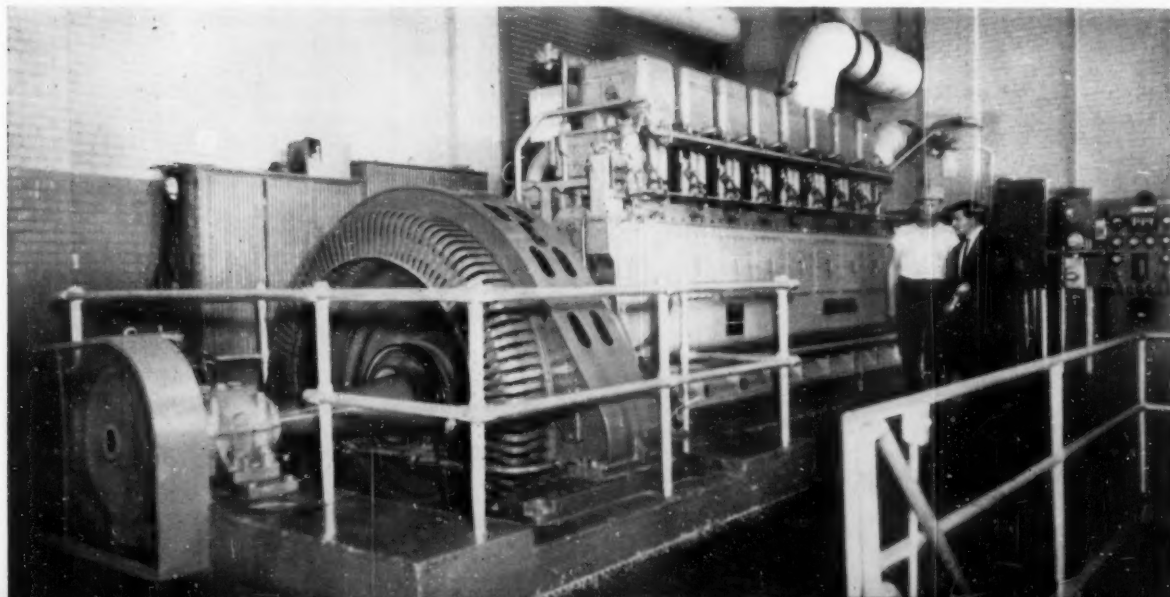
In 1955, it became evident that Tulia must again increase generating capacity, and the city retained Carl C. Cox of Amarillo as consulting engineer to survey needs and supervise plant expansion. The city contracted for a new engine and at the same time took an option on a second unit. A surge in demand for electricity indicated that the second engine would be needed sooner than anticipated, and the option was exercised immediately.

Each of the new engines, operating on natural gas fuel with a small

quantity of pilot oil, drives an 1135-kw, 1419-kva, 3-phase 60-cycle, 4160-volt Electric Machinery alternator with a 15-kw belt-driven exciter. Plant voltage was switched from 2400 to 4160 when the new engines were installed.

Tulia's power plant has been a profitable municipal enterprise. In the 1957-58 fiscal year, of the \$216,286.30 in revenue, it cost just \$82,495.90 for production and distribution of electricity. Another \$57,734.01 went to pay interest and principal on bonds. Of the remaining \$76,056.39, the city used \$15,000 for capital improvement of the street lighting system, \$20,000 for expansion of the electric distribution system, and \$40,000 for the General Fund to pay government expenses and thereby reduce taxes. In addition, the plant supplied all electricity for street lighting without charge to the city.

● SUPERINTENDENT Amos Newby discusses with City Manager Jim White the performance of the new diesels at Tulia, Texas.



METROPOLITAN GOVERNMENT WILL PLAN SEWAGE DISPOSAL FOR THE SEATTLE AREA

Rapid suburban growth may result in areas that are urban in density of homes but having only rural standards of public services. This article tells how the Municipality of Metropolitan Seattle was formed to cope with the problems of "exploding suburbs."

C. A. CROSSER
Executive Secretary,
Municipal League of Seattle
and King County

CONFRONTED by many problems growing out of the torrential expansion of the suburbs outside of Seattle from 67,000 population in 1940 to 128,000 with 20,000 new dwellings by 1959, the citizens of this area contrived a remedy. But this was only accomplished after seven years of work and fighting. Any other American city which is similarly plagued, can do the same.

This is a new agency of local government called the Municipality of Metropolitan Seattle and its Council held the first meeting on Oct. 1, 1958. This new and novel agency lies between King County and the cities. Although it is permitted by law to assume six public services, as a beginning and to cope with the most serious problem, it is now confining its efforts to remedy the sewage disposal crisis in the Lake Washington drainage basin.

Here is what has happened. In the 1930s and 1940s, the areas north, east and south of the City of Seattle consisted mostly of second-growth woods, farms, scattered villages and several small cities.

In the short space of 10 to 15 years, the appearance of the landscape has entirely changed as though at the hands of a John Bunyan scene shifter. The meadows and woodlands are now filled with streets of new houses with occa-

sional islands of business centers. Villages have been transformed into small, smart, commuters' cities.

But there is a seamy side to this picture of splendid, energetic growth. Raw sewage from shoreside homes and effluent from municipal sewage disposal plants were poured into Lake Washington, the scenic and recreational gem of the area. Bathing beaches were closed. Algae was spreading in the beautiful lake and its water was becoming unfit for drinking. Septic tanks in large areas failed to work properly and overflowed on the surface ground, creating grave health hazards. Disposal of household garbage and rubbish was becoming more difficult because of the disappearance of suitable dump sites remote from objecting residences. Clogged highways morning and night brought the words, "rapid transit" and "monorail" more and more into conversation of harassed commuters. Even though these areas had previously been covered by beautiful woodlands, the trees had been erased to build houses. Now these residential areas had no parks. Increasing pupils overflowed the schools so that new ones had to be built. This raised school property taxes far beyond those of the inside city. The unincorporated urban areas had no street lighting and inadequate fire and police protection. Fortunately, the liberal policy of expansion outside the city by the Seattle Water Department provided water for some of these outlying areas.

In other words, while these areas were urban in density of homes

they had only rural standards of public services.

Unless something was done, these menacing problems could culminate into crises in public health, safety to person and property, and in deterioration of property values as discouraged householders moved elsewhere.

What was to be done about this ominous situation? To begin with, in 1951, a committee of about 10 members of the Municipal League of Seattle and King County went to work on the sewage problem. This League is an organization of 4500 members which serves as a rallying place for citizens who wish to be helpful to their community. After studying the sewer problem, this committee formulated recommendations that the Board of King County Commissioners make a survey of the sewage problem in the Lake Washington drainage area and that consideration be given to the possibility of establishing a sewage authority. The County Commissioners did not act on this recommendation.

A joint meeting of three Municipal League committees, with 105 in attendance, was held on Nov. 20, 1953, to discuss sewerage and other metropolitan problems. Attorney James R. Ellis pointed out the various methods which could be employed to cope with them.

As a result, in January, 1954, a Metropolitan Problems Committee of 35 was established to canvass the entire metropolitan situation. Besides League members, it included representatives from the League of Women Voters, the Governmental

Research Bureau of the University of Washington, the State Pollution Control Commission, and the city and county planning and engineering services.

During the next three years, task force subcommittees appraised different plans employed throughout the country to cope with the problem of the "exploding suburbs". The committee issued two reports, *The Shape We're In*, which presented the problem, and *The Shape of Things to Come*, which offered recommendations to remedy matters. The University of Washington Bureau of Governmental Research published a report giving many enlightening statistics. It is interesting that these citizen groups in Seattle publicized the pertinent data in reports at a cost of only a few thousand dollars, as compared with the large sums which have been spent for preliminary surveys in other metropolitan areas.

As an outcome of the committee's work, in June, 1956, the Board of Trustees of the League recommended that a new municipality be established which would provide certain public services for the entire metropolitan area which consisted of most of the populous portion of King County. It emphasized that these services should be only those which this new public agency could perform better than the individual cities. There was no desire to impair the home rule powers and services of cities. In addition, the new municipality was to be governed by a council consisting of some members of the component city councils, of the board of county commissioners, and a few outsiders. This eliminated the necessity for additional elected officials for the new public agency, which was patterned after the Toronto Metropolitan Government. This committee also recommended that the project be turned over to a larger and more representative committee for detailed study and formulation of a legislative program.

As a result, in the fall of 1956, Mayor Clinton of Seattle and the King County Commissioners appointed an advisory committee of 48 representing major groups in the entire metropolitan area to carry on the project to completion. This new group included many members of the League's committee which gave some assurance of putting into effect the major League recommendations which had been arrived at after careful study.

After many meetings the committee approved the above plan and

drafted an enabling act which was introduced into the 1957 session of the Washington State Legislature. Despite strong opposition, the enabling law was passed, making it possible for citizens in a metropolitan area to create by vote a new municipality to provide the six services of sewage disposal, garbage disposal, planning, mass transportation, water, and parks and recreation.

Following the passage of the enabling act, the Citizens Advisory Committee was expanded to 75 members and proceeded to formulate boundaries of the proposed metropolitan district and recommend initial functions. The Commission recommended that the Municipality of Metropolitan Seattle be formed to take on the services of sewage disposal, mass transportation and comprehensive planning. Councils of two of the component cities petitioned the County Commissioners to call an election to vote on this plan at the March, 1958, city elections.

A campaign committee was organized in the summer of 1957 and

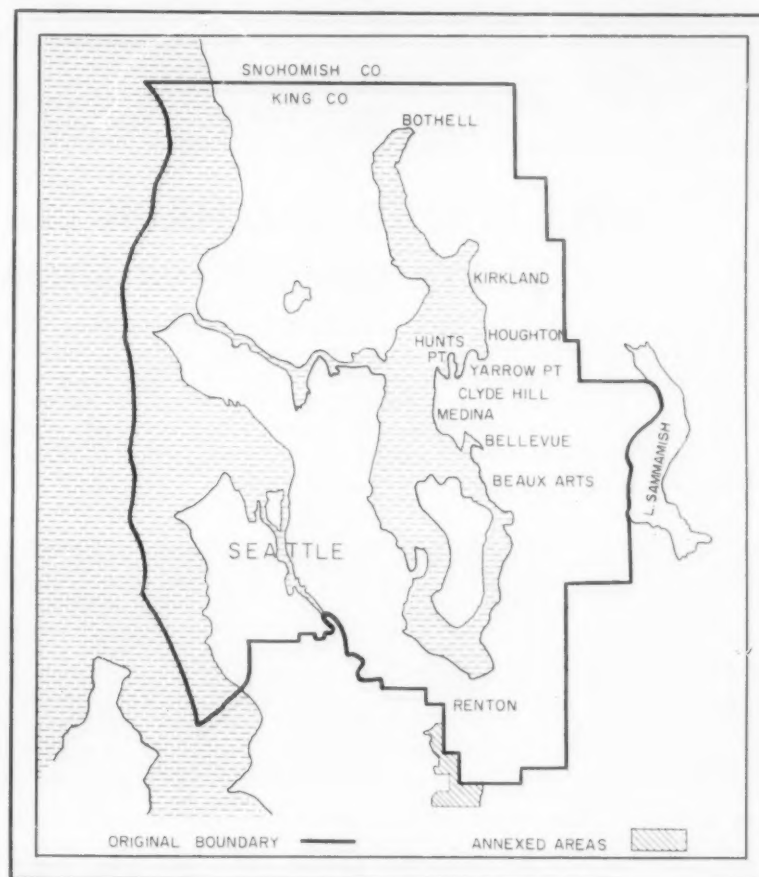
conducted a brisk program. However, strong opposition developed in outlying parts of the district. The measure lost outside Seattle although it carried inside the city and received a favorable overall vote.

Metro supporters then asked the city officials and civic leaders in the areas outside Seattle to suggest ways to make the Metro plan more palatable to their citizens. These responded with suggestions to shrink the Metro boundaries to eliminate the areas which had voted against the plan and to confine its public service to sewage disposal.

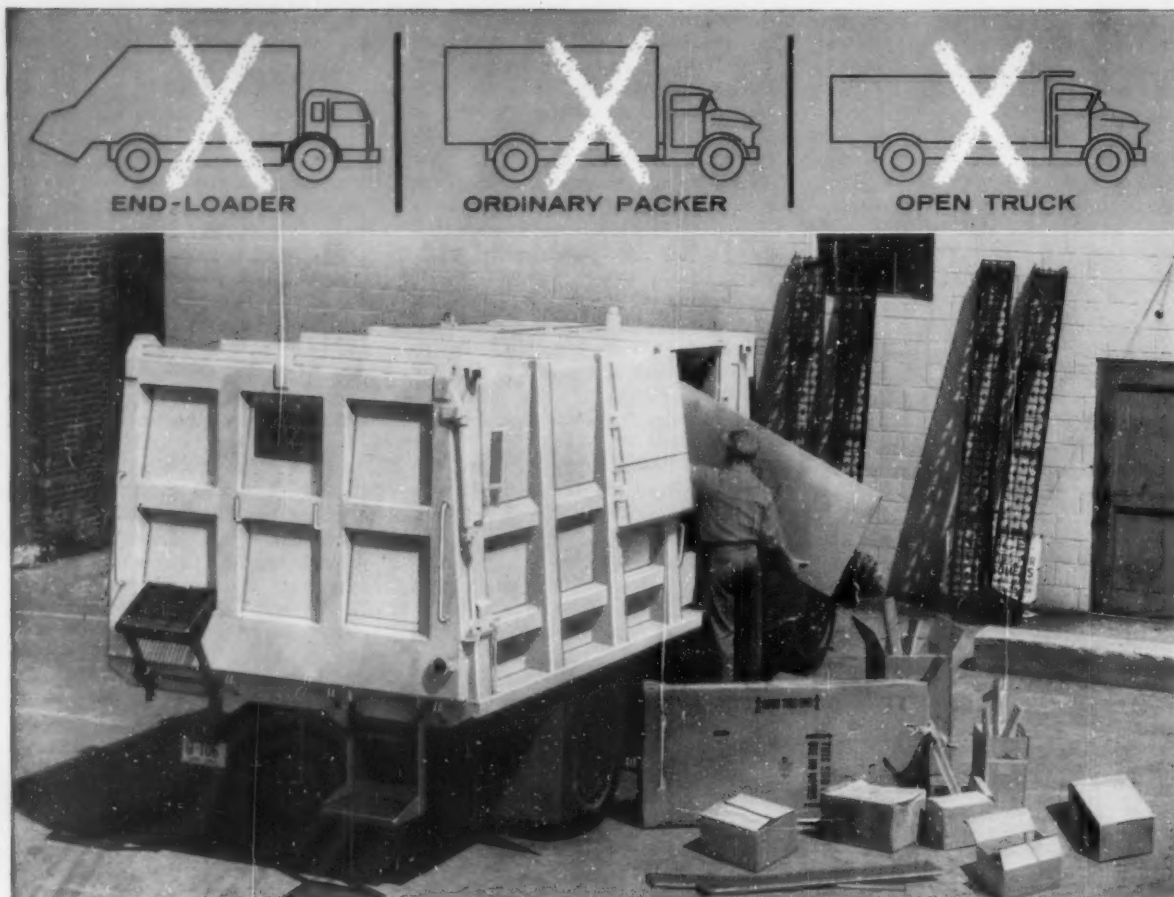
The campaign committee was revived. At an election on Sept. 9, 1958, both Seattle and the outside districts gave a majority approval to the plan and the Metropolitan Municipality was established.

In the fall of 1954 the State, King County and the City of Seattle had employed the engineering firm of Brown and Caldwell of San Francisco to make a comprehensive sewage survey of the Lake Washington drainage basin with recommendations for a plan to eliminate any

(Continued on page 164)



● POLLUTION control in Lake Washington, the body of water at the center of the map, will be the primary project of the new Municipality of Metropolitan Seattle.



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HIGHLIGHTS OF 1959 PUBLIC WORKS CONGRESS

Technical presentations concentrate on both old problems and new developments in public works and sanitation.

Chicago, Ill.—The technical sessions of the 1959 Public Works Congress held in Seattle, Washington, September 21-23 fostered the exchange of information and views on many diverse community public works and sanitation problems. The equipment show once again served as an integral part of the sessions, spotlighting the continuing technological advances which permit doing a better job of providing needed municipal services more economically.

In his keynote address, APWA President, William D. Hurst, City Engineer, Winnipeg, Canada, extended to the members of the 1959 Congress cordial and sincere greetings from his fellow Canadians. He reminded his audience that Canadians and Americans have worked together for many years on a common objective—"the betterment of our communities." He explained that competent leadership and teamwork are especially needed in this present world of change.

Benefits of APWA Chapters

In the Monday afternoon panel discussion on "How Communities Benefit from Chapter Activities," specific examples mentioned were: good intergovernmental relations which are essential for public works

planning and working together; the benefit of new ideas and techniques which come up either casually or formally at a chapter meeting; economies resulting from the standardization of municipal construction; and benefits from training programs such as those specifically intended to correlate the many facets involved in the operation and management of public works departments.

General Session

At the first general session of the Congress, William L. Shannon, Shannon and Wilson, Soil Mechanics and Foundation Engineers, Seattle, Wash., spoke on modern applications of soil engineering. He pointed out that until a few years ago, hillside grading was largely uncontrolled by municipalities. He said that many cities and towns, the Los Angeles area being one example, have recently adopted strict grading ordinances which seek to establish minimum requirements for hillside grading. "It is inevitable," he remarked, "that most cities which experience intensive development of steep hillsides will find it necessary to adopt such a grading ordinance to protect abutting properties, city streets and utilities against damage." He stated that

there has been developed recently a technique for measuring not only the depth of the sliding mass but also its rate of movement. This technique is now being successfully applied to the very large slide at the Pacific Palisades at Santa Monica, and to a number of other large and small slide areas where knowledge of depth of sliding mass and rate of movement of the slide are important.

Refuse Collection Equipment

Public works officials should utilize every safety device that may reduce accidents and personal injuries, Theodore C. Eppig, Deputy Commissioner, Bureau of Sanitation and Equipment Services, Chicago, Ill., told forum members in stressing safety features of refuse collection equipment. A riding place for loaders to and from work assignments should be provided; steps, if used for transportation of loaders between collection points, should be well protected, sturdy support handles provided, and steps must not extend beyond the width or rear of the truck body. He pointed out that the use of upright mufflers has been found to be a desirable factor, particularly for trucks working in alleys where the air is somewhat confined. Here, the exhaust is expelled above the height of the truck, providing improved working conditions for the loaders. The upright muffler

OFFICERS: Jean L. Vincenz, San Diego, Calif., *President*; Frederick W. Crane, Buffalo, N. Y., *Vice President*. **REGIONAL DIRECTORS:** (term ending 1960) Charles W. Cooke, Hartford, Conn.; R. S. Hopson, Richmond, Va.; H. H. Hester, Fort Worth, Texas; (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Morin, Oakland, Calif.; W. A. Bowes, Portland, Ore.; (term ending 1962) Paul R. Screvane, New York, N. Y.; Albert G. Wyler, New Orleans, La.; Edward J. Booth, Bismarck, N. D. *Immediate Past President*, Wm. D. Hurst, Winnipeg, Manitoba. Robert D. Bugher, *Exec. Director*.

over the standard horizontal type provides a safety factor against possible fires in the disposal areas. Eppig also pointed out that control buttons should be located conveniently so that the motor can be killed or stalled in the event of an accident involving loading operations.

Refuse Collection Routes

The importance of good route planning was emphasized by G. B. Robertson, Superintendent, Sanitation Department, Albuquerque, N. M. In a recent survey of the refuse collection practice in Albuquerque it was found that 40 percent of the loads of the larger trucks were only partial loads, while the smaller trucks were loaded in nearly 100 percent of the trips. This fact indicated that reorganization of the routes is needed. During another survey to determine the best type and kind of equipment to buy, it was found that the large truck was faster to load. A lower loading level is the reason for this advantage, as well as the necessity to pack the load fewer times. The survey revealed that time was lost while the trucks were being packed. He explained that they are presently testing the effectiveness of a packing control panel in the tractor

of the cab that will permit packing while the truck is in motion.

Traffic Engineering

Norman Kennedy, Assistant Director, Institute of Transportation and Traffic Engineering, University of California, Berkeley, cited an instance in Modesto, Calif., where stop signs on the major street approaches were removed after appropriate traffic studies were made. There was no general increase in accidents and personal injury accidents actually decreased he said. He related that traffic volumes on the major streets increased by as much as 60 per cent. The four-way stops were removed to facilitate traffic flow, but he emphasized that the decision to do so was based on the conviction after study of accident records and traffic movement, that safety would not be impaired. Results to date confirm the judgment of the traffic engineer, he told forum members.

Separation of Storm Water and Sewage

At the forum on water and sewage, R. G. Anderson, Chief, Construction Division, Tacoma, Wash., said that whether or not storm and

sanitary sewage flow should be separated depends to a great extent upon the existing conditions and future needs for each particular community. Some of the benefits which he thought Tacoma will realize from its separation program are: elimination of sewage filled basements, sewage overflow at manholes, elimination of rat infestations usually associated with combined sewers, and a general improvement in the reliability of the entire system including interceptors, pumping plants, and treatment works, with the resulting lowered cost of operation and maintenance.

Rainfall vs. Runoff

Discussing rainfall versus runoff in municipal storm drainage design, C. S. Seabrook, City Engineer, Puyallup, Washington, pointed out that no two sets of circumstances are the same and that if satisfactory results are to be obtained, procedures must be constantly varied to fit the particular circumstances involved. "If you are an engineer in charge of a storm drainage design project, it is your duty to ascertain first hand those relationships in your own community rather than merely to use the figures that someone else has evolved," Seabrook said.



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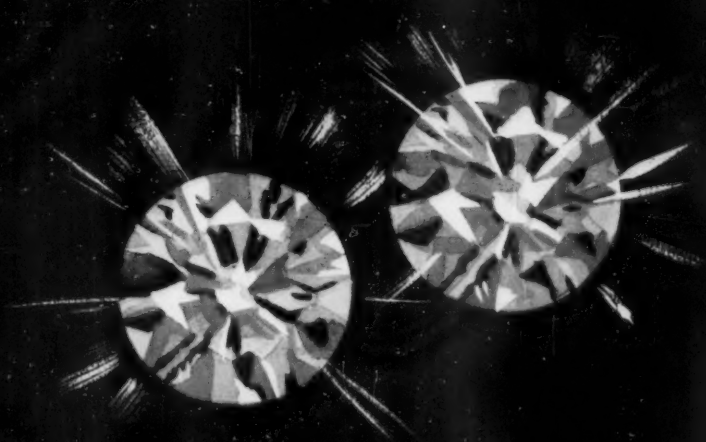
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As an example, he explained that a five-year expectancy is the normal procedure in most cities in calculating rainfall intensities. In reality, he stressed, the selection of a certain expectancy to be used in any storm drainage design is nothing more than determining the amount of insurance that the owner wishes to carry. The higher the expectancy, the greater the cost of the sewer, but the heavier the storm that the area will be insured against.

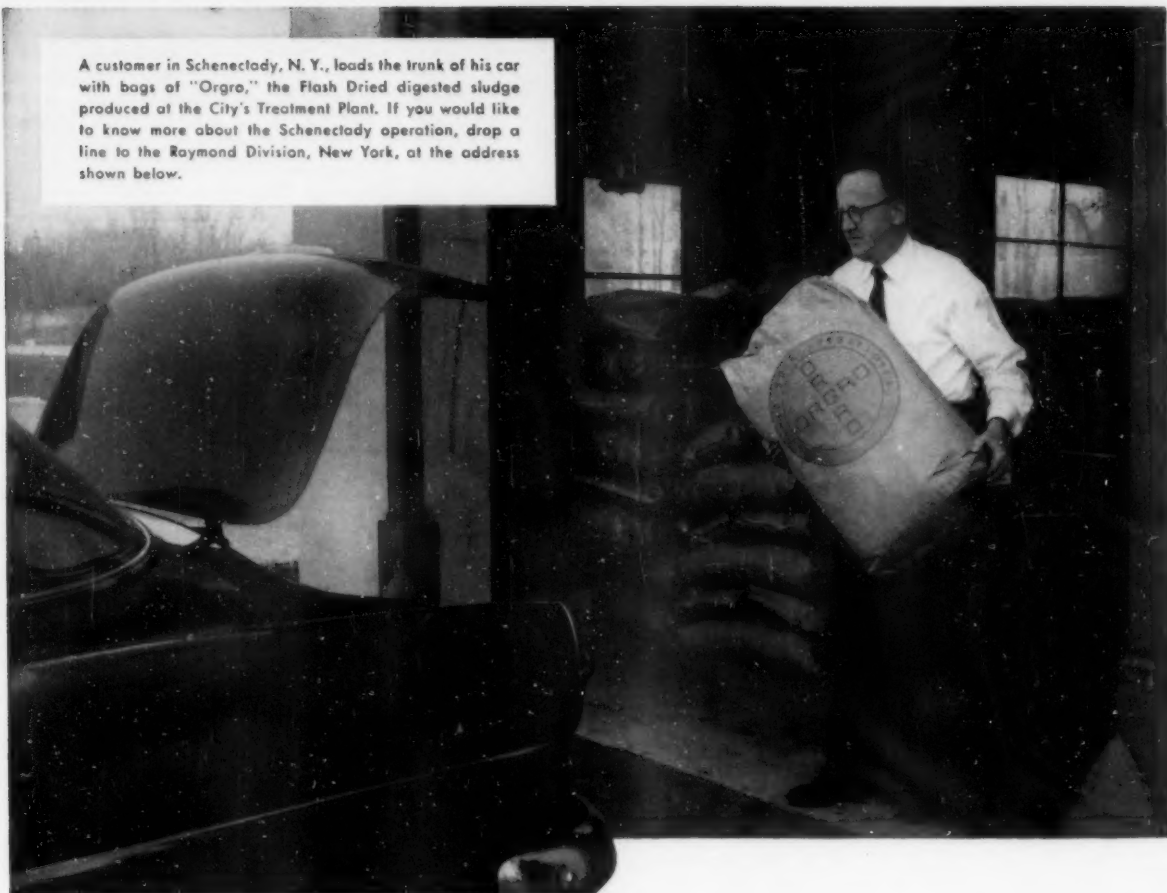
Studying a recent project, Seabrook said, "We became thoroughly conscious of the runoff characteristics of abnormally large paved areas and with this in mind we became curious as to what the difference would be if, instead of calculating normal residential areas on the basis of the whole area and 45% runoff factor, we used only the street and sidewalk area with a 90% runoff factor, completely ignoring the area inside the sidewalks." He said this proved to be one more step toward the ultimate goal of securing the best possible results at the least possible cost. For other factors that might be considered, he listed the extent of universally flat grades that might prevail throughout a city and the extent of highly pervious soil. He emphasized that it is possible to employ design criteria that will result in a very substantial reduction in cost and still have facilities that will provide the necessary service to the community.

As an example of the importance of doing research, Seabrook outlined a study project recently undertaken at Puyallup. He added that if they had used the information available for nearby areas, they probably would have set up the machinery for spending at least \$100,000 more than was necessary. He said that it is purely a matter of maintaining an open mind; of recognizing the many changes that are forever taking place and the utter futility of trying to develop a book of rules that will solve all problems.

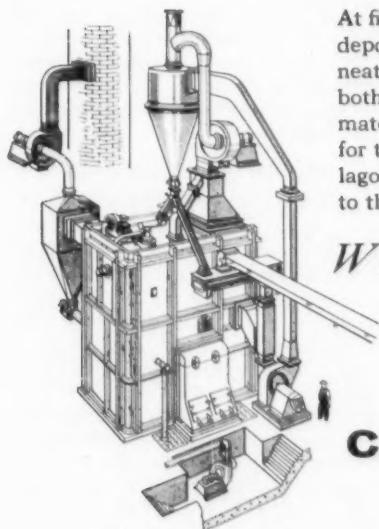
Automotive Equipment

Ernest A. Fort, Director, Department of Public Service, Miami, Fla., told members of the forum on buildings and equipment that the procurement of automotive equipment presents a problem in all cities. He presented the following reasons as to why this is so: (1) purchasing restrictions on governmental agencies, (2) changing demands and increasing requirements of the job, (3) rapid changes in the

A customer in Schenectady, N. Y., loads the trunk of his car with bags of "Orgro," the Flash Dried digested sludge produced at the City's Treatment Plant. If you would like to know more about the Schenectady operation, drop a line to the Raymond Division, New York, at the address shown below.



Can you think of a better way to dispose of sewage sludge?



At first glance, the trunk of a car may seem to be a peculiar place to deposit sewage sludge. But when the sludge is dry, sterile and neatly packaged, it can be a marketable commodity rather than a bothersome waste. When uncontaminated with noxious industrial materials, it is an excellent soil conditioner. Its sale produces revenue for the treatment plant, eliminates the nuisances of drying beds, lagoons and ash disposal and, at the same time, renders a service to the people of the community.

What's the best method of drying sludge?

It's the C-E Raymond Flash Drying System, a system used by communities large and small across the nation, a system proved in service and one which dries more filter cake than all other systems combined.

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4



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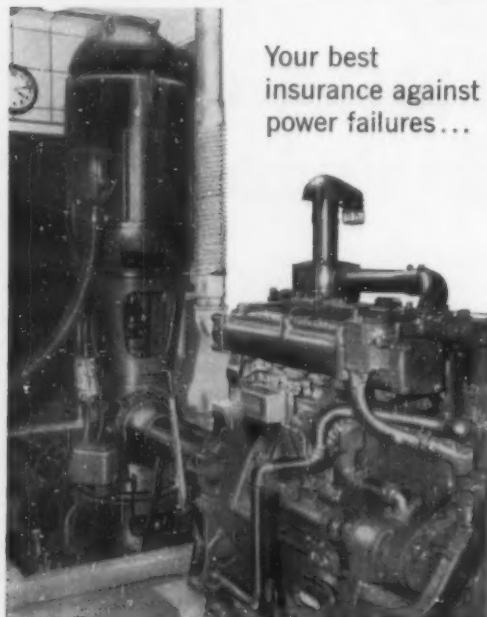
- 1 . . . **VERSATILITY:** This tough, non-melttable black or gray compound will adhere to any construction material in vertical, horizontal and overhead joints.
- 2 . . . **STABILITY:** Igas remains flexible over a wide temperature range. It will not sag or flow in hot weather. It will not become brittle in cold weather.
- 3 . . . **DURABILITY:** Even after years of exposure, Igas will not lose its effectiveness. Containing no solvent, it will not dry out nor shrink.
- 4 . . . **RESISTANCE:** Igas resists sewage, salts, non-oxidizing acids, dilute acids and sea water. It is non-toxic.

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various features and improved capabilities of the equipment, and (4) the increasing cost of the initial purchase, maintenance and operation of the equipment. Fort emphasized that while the initial cost of equipment is very important, it should not be the only governing factor. "The most economical unit of equipment," he said, "is the one that will perform a function at the lowest cost per work unit done, computed over its life-time." He said this should be the principal governing factor in determining the equipment that is to be purchased. He explained that in order to obtain the information needed to decide which equipment has the lowest work-unit cost, it is necessary to keep cost records on existing equipment to show: the initial cost, cost of maintenance and repair, cost of down time, cost of fuel and lubrication, length of economical usage life, salvage value when sold or traded, proximity or availability of parts for repairs, dependability of performance, and ability to do the work specified.

• • •

Who Collects Garbage in Cities?

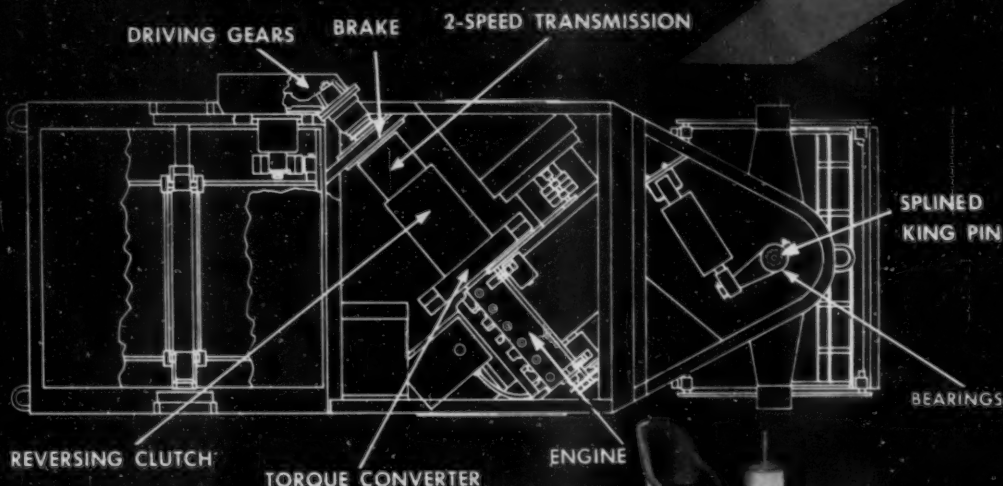
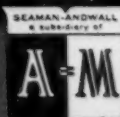
On the 1958-1959 questionnaire sent by PUBLIC WORKS Magazine to city engineers, city managers, directors of public works and street superintendents these questions were asked on garbage collection: Is garbage collected by municipal forces or by contract; and are private collectors or a combination of two or more methods used?

There were 1356 replies to these questions. Here are the answers: 701 municipalities use their own forces to collect garbage; 351 let their garbage collection out by contract; and 304 municipalities use private collectors or a combination of private, contract and/or municipal collection.

Results of Fluoridation

The annual report of the Norway, Me., Water District states that, after five years of fluoridated water at home and at school, Norway's six-year-olds have 90 percent less decay in their permanent teeth, 42 percent less in their "baby" teeth. The 10-year-olds have 30 percent less decay in their permanent teeth. The 14-year-olds have 13 percent less decay in their permanent teeth. Of the children having fluoridated water only during school hours, 10-year-olds have 24 percent less decay in their permanent teeth and 14-year-olds have 8 percent less decay.

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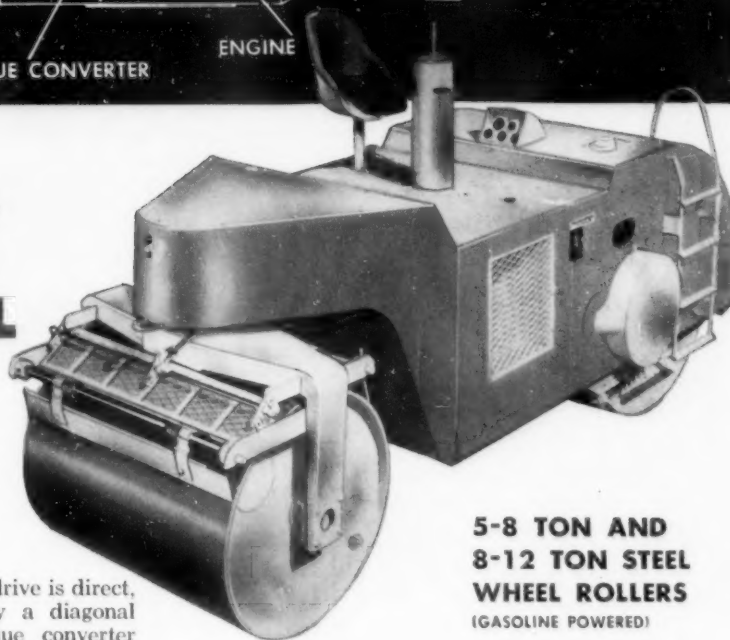


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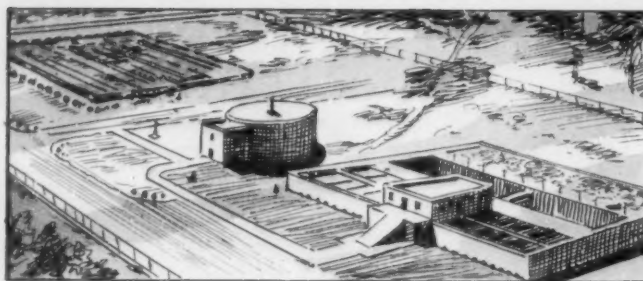
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Prepared by ALVIN R. JACOBSON, Ph.D

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Surface Reaeration Studies

The investigation reported upon in this article constitutes a reexamination of the effect of domestic sewage on atmospheric reaeration of water. The solubility of oxygen in sewage does not differ significantly from its solubility in pure water under the same conditions. From consideration of the results of these studies, the following conclusions are drawn: 1) The rate of atmospheric reaeration is directly proportional to the rate of circulation of the water, within the limits of turbulence where the water surface remains unbroken; 2) the solubility of oxygen in sewage is not significantly different from its solubility in pure water; 3) domestic sewage depresses the reaeration rate of water, the extent of the depression depending on the strength of the sewage and the relative quantity of it present; 4) the reaeration rate of undiluted domestic sewage of average strength is about 60 percent as great as that of clean water under the same conditions; 5) polluted streams are unlikely to contain enough sewage to depress reaeration to less than 95 percent of the clean water rate. In domestic sewage, the concentration of the compounds affecting reaeration is proportional to the BOD of the sewage.

"Laboratory Studies of Sewage Effects on Atmospheric Reaeration." By M. C. Rand. *Sewage and Industrial Wastes*, October, 1959.

Composting Waste Sludge

About 6 to 10 tons of organic sludges at the Pearl River plant of the Lederle Laboratories are accumulated per day for disposal. This comes from fermentation of antibiotics, extraction of pharmaceuticals from animal livers, stab-

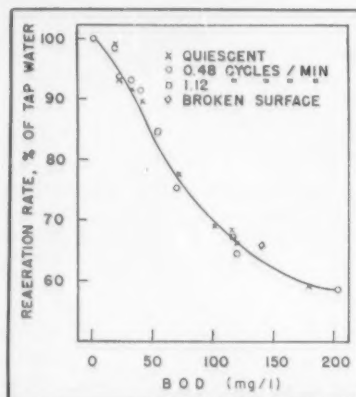
bing of animals, and the sanitary sewage from 4,000 employees. The pilot plant investigations began at Pearl River in 1953 using a "Multi-Stage Composting" procedure. In this procedure, one day is specified as the time to complete one full stage or cycle of decomposition. The total number of stages was determined by experiment. From the results of these and other trials a routine procedure was established so as to produce satisfactory decomposition of these wastes. The sludge is dewatered, trucked to the composting site and dumped on a prepared bed of sawdust and animal manures. It is then mixed with a small amount of material from the previous stage to seed the mass with organisms. About one part finely ground rock phosphate is added for each 200 parts of the fresh mixture and the entire mass is piled in a long windrow next to the previous day's batch. Periodically the masses are sampled for pH, moisture content, temperature, and COD during the composting period of about 5 months. During dry weather this material is trucked inside a high

roof building which holds about 1,000 tons of compost, where the crude material is re-shredded to a fine particle size, and to a moisture content of about 40 percent. The granular, free-flowing compost material is used on Lederle's grounds, by the nearby communities, and it is sold through a local dealer mainly for lawn treatment and soil conditioning.

"Composting Waste Sludge From Pharmaceutical Manufacturing." By A. J. Gabaccia. *Sewage and Industrial Wastes*, October, 1959.

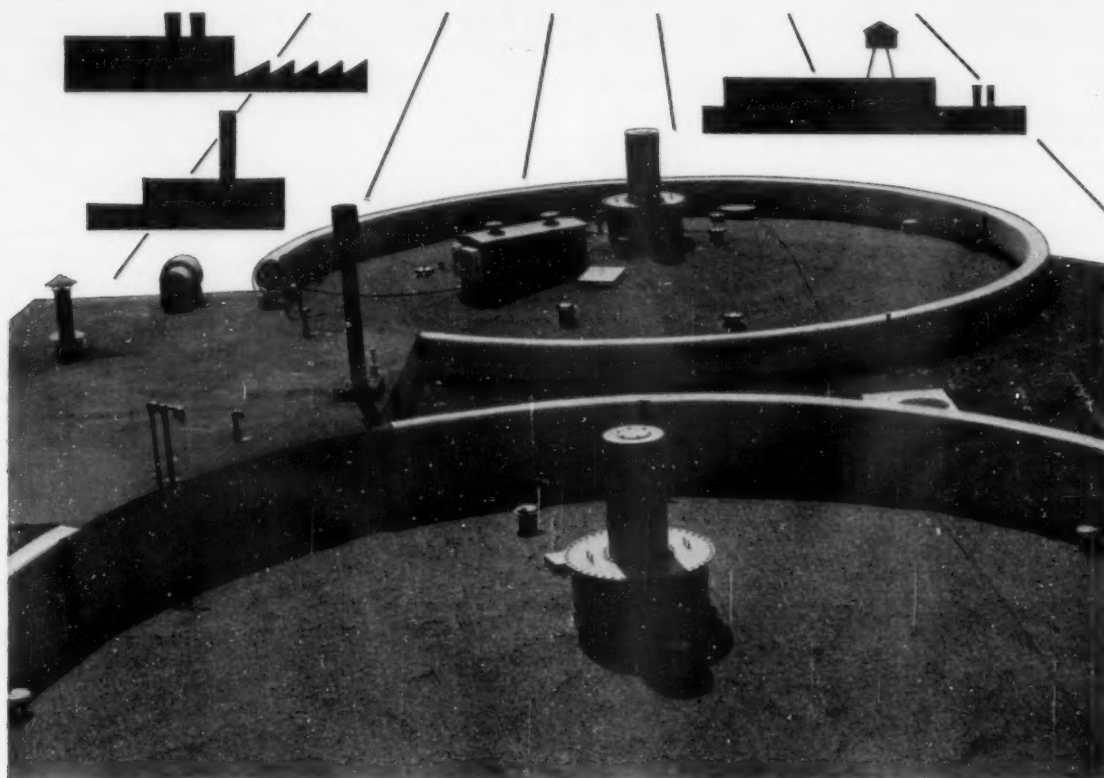
Our "Weary Rivers" of 1959

Obviously, the problems of stream pollution result from population and industrial growth and concentrations in an expanding technological society. The authors comment briefly on six pertinent points which provide the background for evaluating this problem. They are: 1) Our expanding population will go up from 178 million in 1959 to an estimated population of more than 270 million in 1980—an increase of 50 percent in the next 20 years; 2) the trend toward metropolitan growth will accelerate; 3) the total water needs per capita will more than likely double during this period; 4) to meet the basic needs of the growing population, industry will produce two or three times as much as it does now; 5) with this increase in industrial and population growth there will be a concomitant increase in industrial wastes of greater and greater variety; 6) more and more emphasis must be placed in pollution control so as not to befoul our sources of water supply which will become more critical in this expanding economy. Our current parameters of pollution—the 5-day BOD, the bacterial indicator organisms, natural organic and inorganic



Courtesy Sewage & Industrial Wastes

● CURVE shows reaeration rate as a percentage of tap water rate to the BOD.



Here are Reidsville's two 45' P.F.T. Floating Cover Digesters

Reidsville's Sewage Treatment Plant Ready TODAY for TOMORROW'S Industrial Development

Forward-looking Reidsville, North Carolina is now ready to treat flows from the many new industries which are rapidly moving into this area.

Not only does this modern 3.0 mgd high-rate filter plant comply with the requirements of the North Carolina State Stream Sanitation Committee and its pollution abatement program for the Haw River Valley, but it is actually *five years ahead of the deadline* set by the Committee.

Designed by Piatt and Davis, Consulting Engineers of Durham, N. C., this plant is equipped with the following P.F.T. equipment: two 45' Floating Cover Digesters, one with complete Pearth Gas Recirculation System; one #250 Heater and Heat Exchanger Unit, Supernatant draw-off equipment and Gas Safety Equipment.

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The P.F.T.-Pearth System shown above assures full use of digester capacity.

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substances, even tastes and odors—all were developed in the early stages of modern sanitary engineering. They are still important to the concept of assimilation of pollution and to the measurement of self-purification phenomena of streams, but they do fall short of being effective measurements as the character of pollution changes and as re-use of water supplies becomes a dominant factor in the water resources picture. Greater emphasis must be placed on research to develop new treatment processes for these increasingly complex waste materials.

"Dilution Is No Longer the Solution for Pollution." By Dr. Mark D. Hollis and Gordon E. McCallum. *Wastes Engineering*, October, 1959.

400 Tons Per 8-Hour Shift

Glasgow, Scotland's new 400-ton refuse disposal plant, serving this City of 1,000,000 population, was constructed on a 22-acre site at a cost of approximately \$5,000,000. The plant comprises four independent sections of 100 tons capacity each. Trucks enter the second floor reception bay by means of an inclined approach drive. After being

weighed, the trucks discharge the refuse into any of four steel hoppers fitted with plate feeders that automatically take it to the elevating conveyors which discharge the refuse into four primary rotary screens for separation of screenings. Facilities on the reception floor provide for removal and transfer of bulky material, trade waste, and separately collected paper. The recovery of most salvaged materials takes place on four horizontal sorting belts. Tins and ferrous metals are recovered in two ways: first by four overband electromagnetic separators fitted over the sorting belts and secondly by four magnetic pulleys at the heads of the conveyor taking screenings from the primary to the secondary screens. Bailing equipment consists of two hydraulic double-ram machines for scrap metal, one mechanical vertical press for scrap paper and two mechanical twin-rack balers for textiles. The remaining refuse from the sorting belts is conveyed by other belts to the desired incinerator. Each furnace consists of a steel unit with five hydraulically clinkered grates. Furnace gases from the combustion chambers pass through multi-vortex grit collectors incorporating an induced draft fan, centrifugal, primary and secondary collectors, and grit settling tanks before being discharged through either of two 220-foot-high smokestacks.

"400 Tons Per 8-Hour Shift". *The American City*, October, 1959.



Revolutionary TRUCK-LODER Frees One Man For Other Sewer-Cleaning Jobs!

The Truck-Loder Bucket Machine brings the deposits direct from the sewer to truck *non-stop!*

It ends the hard dirty work of manually pulling on the bucket to dump the load; shoveling the deposit from street to truck; and cleaning up the street afterward. It's faster — easier — more sanitary. In other words, it puts an extra man in your Sewer Department at *no extra cost*.

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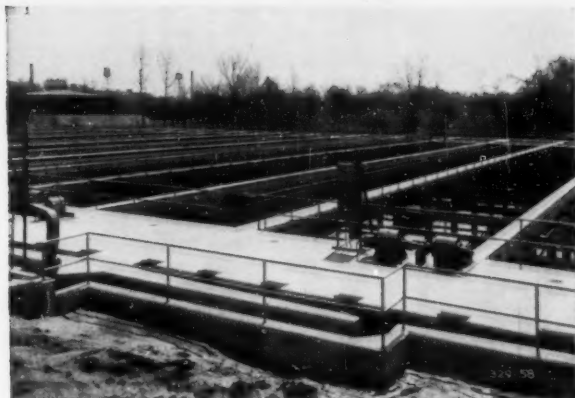
To get the full Truck-Loder story, write for the name of your nearest "Flexible" Distributor.

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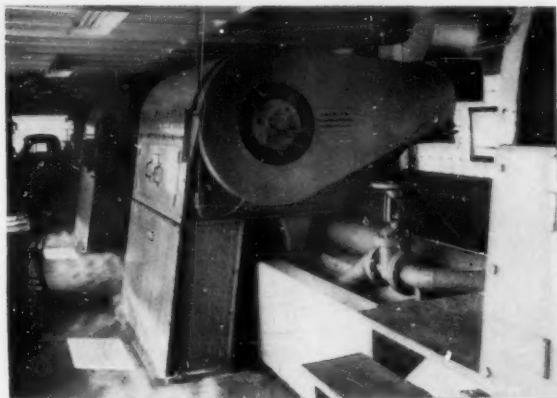
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1005 SPENCERVILLE ROAD, LIMA, OHIO
415 S. ZANGS BLVD., DALLAS, TEXAS

Locating Secondary Treatment Units

The secondary sewage treatment works now under construction for the City of Wichita, Kansas, are being located approximately 3.5 miles downstream from the primary plant on the Arkansas River since the existing plant site is limited in extent and cannot be expanded. The first phase of work on these improvements includes a 66-inch settled-sewage transmission main between the plants, and facilities at the new plant for secondary treatment by means of trickling filters, chemical treatment of secondary sludge, digestion and sludge drying beds. The contract for the second phase of construction includes additional secondary treatment facilities, additional sludge digestion facilities, and the first unit of new primary treatment facilities at the downstream location. The plant is laid out on a unit basis, with each unit consisting of a group of four trickling filters and one final tank



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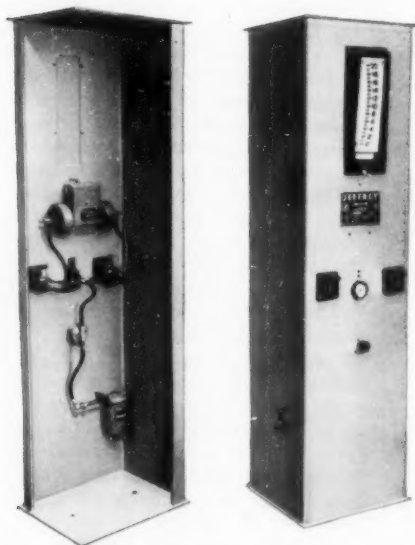


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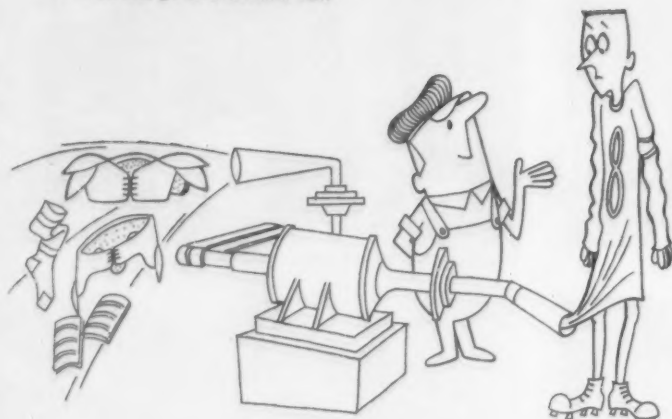
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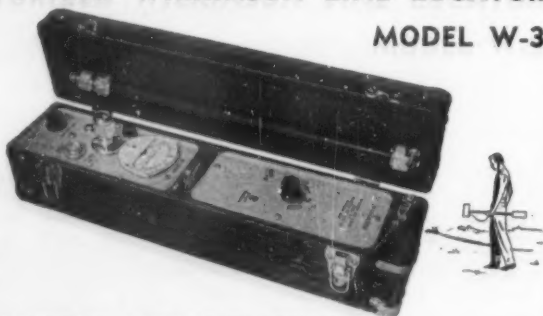
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and served by a separate pump at the pumping station. Three clusters or groups of four trickling filters each, or a total of 12 trickling filters will be provided. Three final basins are being constructed, one serving each of the trickling filter groups. Sludge conditioning facilities consist of a chemical building, a rapid-mix chamber, and a combination flocculation and sedimentation basin. The sludge will be pumped to three 100-foot diameter sludge digestion tanks each of which are being provided with a high-rate sludge recirculation system.

"Secondary Sewage Treatment Facilities are 3 1/2 Miles From Primary Plant." By Lloyd W. Weller. PUBLIC WORKS, November, 1959.

Metropolitan Sewage Disposal

Oakland County, Michigan, was faced with serious difficulties in terms of sewage disposal having experienced a 42 percent population increase in the last nine years. As part of the Detroit Metropolitan Region (and the second largest of Michigan's counties) they were destined for an additional tremendous growth in new homes, commercial establishments and, eventually, industry. The County Board of Supervisors established the Clinton River Sewage Disposal System and placed it under the administration of the County Department of Public Works. The Department is preparing construction plans for the project with the aid of a "planning advance" from the Federal Housing and Home Finance Agency amounting to \$399,600. The plan involves construction of interceptor sewers to transport all sewage to a central treatment plant. The sewage treatment plant will consist of a combination of standardized components selected according to individualized plans prepared by consulting sanitary engineers to meet the present requirements and for a few years into the future. Eventually, the main collecting line and the interceptor sewers will tie into a major sewage treatment plant which will be built at some time in the future. The present plant can be expanded by adding new units and converting to mechanical treatment until such time when it will be economically feasible to construct the larger sewage treatment plant to serve the area now developing.

"Providing Sewage Disposal for a Metropolitan Area." By Howard K. Schone. PUBLIC WORKS, November, 1959.

In KNOXVILLE, TENNESSEE



TYLOX Rubber GASKETS, REXON Rubber GASKETS, and REXON PIPE COATING



PREVENT JOINT LEAKS, WHIP ACID ATTACK AND SPEED PIPE LAYING ON STORM-SANITARY SEWER PROJECT

Engineers and city officials went "Hamilton Kent" all the way, in the matter of selecting *leak-proof* pipe joints and *acid-resistant* pipe coating to protect Knoxville's new Riverfront-Willow Avenue sewerage and drainage project . . .

Heavy duty precision TYLOX Gaskets coupled the large diameter T & G concrete storm lines. REXON "K" Light Duty Gaskets jointed the smaller diameter B & S sewer lines, and tough, non-deteriorating REXON No. 2 Pipe Coating put a protective covering inside all lines that would serve nearby stockyards, butchering plants and other industrial installations.

In specifying Hamilton Kent TYLOX and REXON rubber Gaskets, and REXON Pipe Coating, engineers and city officials not only provided to the utmost for the safety and long life of the system, but made possible substantial savings in construction costs . . . Both TYLOX and REXON Gaskets are quickly assembled to pipe, and permit fast assembly of the line. Their flexible, *compression* seal compensates for pipe angularities, allows wet trench coupling, and immediate backfilling.

- **WRITE FOR BROCHURES** describing and illustrating use of Hamilton Kent TYLOX and REXON Gaskets and REXON Pipe Coating. Specify these products to protect your pipe projects from leakage and acid attack.



PROJECT: For City of Knoxville, Tenn., Riverfront-Willow Ave. storm and sanitary sewers.

ENGINEERS: H. R. Neal, City Engineer, and Roy I. Gentry, Service Director.

CONTRACTORS: Division A—Harrison Construction Company, Alcoa, Tenn.
Division B—Blont Brothers Construction Company, Montgomery, Ala.

PIPE: T & G and B & S Concrete Pipe, manufactured by Sherman Concrete Pipe Company, Knoxville, Tenn.

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Report Covers First Year's Operations of County Sewage Disposal Facilities

THE MIDDLESEX COUNTY Sewerage Authority trunk sewer system and treatment plant was placed in operation in Jan., 1959. The system serves or will serve communities along the Raritan River, including New Brunswick, N. J., and 12 other municipalities and a number of industries. Sol Seid is chief engineer; M. C. Rand is chief chemist; William Koptonak, plant engineer; and Metcalf & Eddy, consultants. The data below are from the excellent first annual report.

The sewerage system has 27.16 miles of pipe up to 84 inches in diameter. The Central Treatment Plant is designed to treat 78 mgd., average flow, or 115 mgd peak flow. As of the start of operations the planned capacity of the plant is 52 mgd. To arrive at maximum plant capacity of 78 mgd, two additional clarifiers will be built, which will add a capacity of 26 mgd. This is a chemical treatment plant.

The Operational Flow

The system's two principal collecting lines are the 60-84 inch Main Trunk and the 45-48 inch South River Interceptor, both gravity lines, which discharge raw domestic sewage and industrial waste to the Sayreville Pumping Station. Here, bar screens remove coarse debris to protect the four pumps, each pump having a capacity of thirty-five mgd. A 72-inch force main conveys the flow to the Central Treatment Plant.

At the Central Treatment Plant, the force main discharges into the headworks, where the sewage is prechlorinated and lime is added to aid in the subsequent treatment. Abrasive material is removed and collected mechanically in the grit chambers immediately following the headworks, and this material is pumped to the sludge storage tanks. Emergency raw sewage bypass lines lead from the effluent channel of the grit chambers to the chlorination chamber.

Normally, the grit chamber effluent flows by gravity in an 84-inch line through the basement of the main building, where a venturi section measures the flow, and on to the Distribution Chamber. Here, chlorinated copperas is added and gates divert the flow to any one or all of the four 130-ft. circular clariflocculators. Gentle agitation in the

central compartments aids the growth of the chemical floc into aggregates large enough to be removed by settling in the outer compartment. The clariflocculator effluent flows by gravity to the chlorination chamber where it is postchlorinated before entering the outfall to the dispersion basin 1½ miles off shore in Raritan Bay.

Sludge from the clariflocculators is carried by gravity to pumps and is pumped back to the distribution chamber for recirculation or to the sludge thickeners. Thickened sludge is pumped to the sludge storage tanks. Other pumps move stored sludge to the dock where it is loaded on barges for final disposal at sea.

A total of over one million gallons per day of process water is required for transporting lime, copperas, chlorine and grit, lubricating pump bearings, washing floors, and sprinkling lawns. For such purposes, treated effluent is pumped through fine screens, chlorinated, and reused, saving 1 mgd of city water. Eighteen pumps return the process water to various parts of the plant.

Participant Metering and Sampling

The life blood of the Authority is the money collected from the participants. This is accomplished through charges for quality and quantity. The charges are broken up into four parts: flow, BOD, suspended solids and chlorine demand. The chlorine demand charge is based on actual use of chlorine at the plant.

It is important to have accurate metering of each of the participants. This is accomplished by individual meter chambers at each point of discharge. The measurement is accomplished by Parshall flume, Kennison nozzle or a Venturi tube. At the present time there are 19 Parshall flumes varying in size from 3-in. to 36-in.; the 3 Kennison nozzles are 10, 12, and 16-in. in size; the one venturi tube is throated down from a 16¼-in. diameter rubber lined pipe to that of 7 ins. Above ground, over each meter chamber, indicating and totalizing meters record the flow of sewage. Daily totalizer readings are taken, and the indicating charts are changed weekly.

In order to obtain, with the minimum expenditure of effort, accurate

data as to the quality of the individual contributions the staff of the Middlesex County Sewerage Authority, in collaboration with the Hydra-Numatic Sales Co., developed an automatic sampler.

These samplers are designed to give daily composite samples, proportioned according to the flow variations at the point of installation. One is installed at each meter chamber, and connected electrically to the meter so that signals relating to the flow are transmitted to the sampler. The electrical equipment within the sampler is so arranged that a fixed volume of sample is collected each time the meter has totalized a certain volume of flow. In this way the samplers produce each day a weighted composite sample of the waste discharged into the trunk system by each individual participant. The results of analysis of these samples are then used together with the flow figures in determining each participant's share of the total cost.

It was estimated that to perform sampling by hand comparable to that provided by the automatic samplers would have required a crew of over a hundred men assigned exclusively to this duty. Any compromise to reduce the personnel requirements and cost of the hand sampling program would have also reduced the frequency and regularity of the sampling and given rise to questions as to whether the samples collected were truly representative of the average composition of the wastes discharged.

Chlorination Control

The Authority's permit to operate its Central Treatment Plant specified that the effluent be chlorinated to meet certain bacteriological standards. The standard specified by the New Jersey Department of Health is that, of all samples of chlorinated effluent tested, not more than 20 percent shall show the presence of more than one coliform organism in five milliliters. The Interstate Sanitation Commission specifies a slightly less stringent standard, permitting up to 50 percent of the samples to show more than one coliform organism in five milliliters. Since both standards must be met, the more stringent becomes the controlling one.

The problem of controlling the chlorination of the effluent is complicated by the fact that the chlorine demand of the effluent is both high and variable. The average demand during 1958 was 49 mg/L, with daily averages ranging from 14 to 127

mg/L. Moreover, large and sudden changes often occur from hour to hour. For this reason, careful control is needed to avoid wasteful overchlorination during periods of low demand, while still insuring adequate chlorination when the demand is high.

To obtain the degree of control needed, the effluent is tested for residual chlorine every 30 minutes. A schedule has been set up which indicates the required adjustment of the chlorine feed in terms of the observed residual. Thus, if the residual chlorine concentration is more than the desired "target residual," the feed is decreased, and if the residual is below the target the feed is increased.

Finding the amount of adjustment required for various observed residuals required repeated analysis of the chlorination records. Meanwhile, the chlorination records were closely compared with the results of the bacteriological tests of the effluent to determine the target residual which gives total compliance with the required standards with minimum chlorine consumption.

The end result of this program is a target residual of 0.6 mg/L, with specified increases of feed for lower observed residuals, and decreases for higher residuals. The bacteriological results show that whereas the standard requires that 80 percent of the chlorinated effluent samples contain not more than one coliform organism in five milliliters, this schedule produces coliform numbers of less than one per five milliliters in about 85 to 90 percent of the actual samples tested. In other words, it is now possible to accomplish strict compliance with the requirements by allowing only a narrow margin of safety, thus resulting in maximum economy in the use of chlorine.

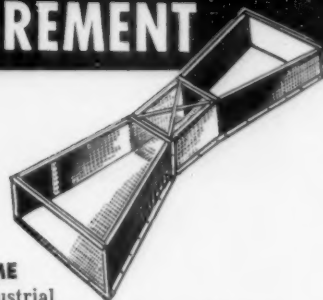
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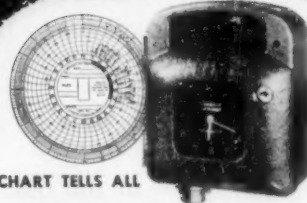


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THE HIGHWAY AND AIRPORT DIGEST



Prepared by **FRANK FORCE**, *Digest Editor*

Assigning Traffic to a Highway Network

The construction of a highway network to serve a large urban area extends over a period of many years and involves the expenditure of several hundred million dollars. Before undertaking this long and expensive task, highway officials should know whether the network will adequately and efficiently accommodate future traffic. This article describes the use of a high-speed computer in assigning estimated future traffic to a complete network of highways. In the process, traffic volumes are recorded on each individual highway link as well as the turning movements at each intersection. Thus, the engineer can investigate a series of alternate locations or design standards and measure their effect on the entire highway system. The assignments can be made rapidly, inexpensively, and with a minimum amount of manual work. The program is also consistent and reproducible from one location to another. At the option of the user, provision can be made in the program to allow for one-way street operation, turn restrictions or delays, and peak hour traffic volumes by direction.

"Assigning Traffic to a Highway Network." By Glenn E. Brokke, Highway Research Engineer, Division of Highway Planning, Bureau of Public Roads, Public Roads, October, 1959.

Movable Bridge Controls

Improvement in movable bridge operation is directly related to the development of better methods of bridge control. Usually, when advantages in operational function are realized, either a new or improved control scheme is responsible. The consulting engineer faced with the design of an electrical control system for a movable bridge first

must establish a proper standard of reliability. This requires a thorough study of the job with regard to both physical conditions and financial limitations. Initial cost saving and minimum maintenance are prime requirements. However, good operating practice must be observed to insure continuous service from vital electric drives. Essentially, control systems are about the same for the two common types of movable bridges—the bascule and vertical lift. A typical sequence of operation, common to most bridges, is as follows: Traffic lights are changed to red and warning gongs are sounded; traffic gates and barriers are closed; bridge centerlocks and endlocks are withdrawn; and opening of span leaves or lifting of deck is initiated by turning the master controller to points desired to obtain the speed and torque required. Most bascule type bridge installations have two drive motors at each end of the movable span. Vertical lift bridges with tower drives must be provided with a means of raising both ends equally to prevent structural damage

through misalignment. Conventional A.C. bridge control; A.C. control with power selsyn tie systems; A.C. reactor control system; and D.C. adjustable voltage control system are the various types of controls.

"Systems to Consider When Specifying Movable Bridge Controls." By Trygve Maseng, T. Maseng & Associates, Louisville, Ky. *Consulting Engineer*, October, 1959.

Liability Insurance

Most counties have recognized the need of providing some insurance against injuries or damages that may possibly be caused by their various construction and maintenance operations. The importance of adequate protection through insurance is more than emphasized by special laws in most states restricting the rights of governmental units under certain operating conditions. The cost of liability insurance for Douglas County, Wash., is over \$4800 yearly. Since liability is a possibility, and since suits are not unusual, it is good sense for a road department to spread its risk and avail it-

Pneumatic Tired Roller Smooths New Surface



● ON SIX miles of blacktop construction over existing pavement near Glenview, Ill., Contractors & Material Co. used 12-ton Galion roller with IHC U-220 engine.



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Nothing matches salt as an effective, inexpensive, remover of snow.

But, salt-slush corrodes automobiles, bridges, manhole covers, and other public equipment and structures.

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Banox and rock salt is available from many suppliers.)

This means that an entire city can be protected from winter salt corrosion for only a few cents per capita.

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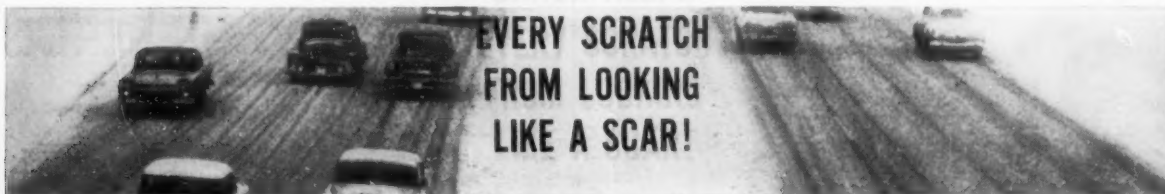
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self of liability insurance. The Board of County Commissioners had a complete analysis of the needs of the county by a reputable insurance firm. Such a firm should give a careful analysis of needs, prompt servicing of policies and claims, and complete confidence and honesty in representing you in insurance matters. The county should select an agent and a company and do business with them over a long term. Insurance up for yearly bid is not a good risk and usually costs more in the long run.

"Liability Insurance is a Must for County Operations." By Pat Thomson, Douglas County Engineer, Waverlyville, Wash. PUBLIC WORKS, November, 1959.

Design of Prestressed I-Beams

The most efficient way to design a prestressed beam is, first, to determine the dead load, live load, and impact unit stresses on the full gross sections of the beam (neglecting the transformed area of any strands of prestress steel). Then the proper initial pre-stressing force is found that will relieve the objectionable tension stresses caused by the dead, live and impact loading. The complete design of a beam as pre-

sented in this article with formulas, tables and graphs provides a step-by-step solution. This article accomplishes three purposes. It helps designers in setting up prestressed beam calculations; it shows them short-cuts in arriving at the final answer, and, of most importance, it stimulates inquiry into the basic theory of plastic flow and the other unsettled questions vital to prestressed concrete design.

"The Design of Prestressed Concrete I-beams." By John F. McDermott, Chief Structural Engineer, Michigan Associates, Consulting Engineers, Lansing, Mich. PUBLIC WORKS, November, 1959.

New Seeded Grass Blankets

Seeded blankets for grass planting which can be easily rolled out and tamped down have been tested successfully at the University of New Hampshire. The blankets, developed by Troy Blanket Mills, consist of a 4-oz. jute with a bottom layer of special paper, and contain seed, fertilizer, pH control, vermiculite, grub control agents and organic mulch which provides a uniform distribution of $3\frac{1}{2}$ tons per acre. Any combination of seed, fertilizer, moisture control agents, etc., can be used

for a specific location, and in any given case special formulas and ingredients can be incorporated right in the blanket. To place the blankets, first, a cut is made in the under soil, which has been finished roughly by hand shovels. The end of the seeded blanket is placed in the cut and covered with sand and gravel to hold it. The blanket is then rolled out from the tied-down end and cut to the desired length. When the blankets are laid side by side they are overlapped a few inches, and held in place by near-by material. No regular seeding of the ground or overseeding of the mat is necessary. The rolls come in varying lengths and are 106 ins. wide.

"University Tests New Seeded Grass Blankets For Highway Landscaping." Roads and Engineering Construction, October, 1959.

New Type Median Strip is Easy to Install

The Cook County Highway Department, Chicago, Ill., is using a new type of divider strip to reduce accidents and separate traffic movement on six Chicago streets. The strip consists of metal mesh, specified as 1-in. by 14 gauge, and concrete filling. When completed it



How Mud-Jack® corrects sunken slabs

Want an easy, low-cost way to raise settled sidewalks, street slabs, curbs, gutters, driveway approaches? Check Koehring® Mud-Jack. It pumps soil-cement slurry under pressure into small holes drilled through pavement. This displaces air

pockets, water or water saturated materials — raises the concrete slab — leaves firm permanent sub-grade. Two sizes available: A small portable Mud-Jack for cities, a larger model for maintenance, low-cost repairs on highways.



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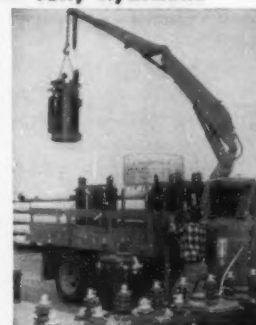


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FAST...ECONOMICAL...



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This safety feature is important. "Because of the feed plate with its safety spring the men can't get hurt by any back-throw from the Chipper," explains the Superintendent, The Park and Shade Tree Commissions, Bridgeton, New Jersey.

Please send in the coupon for more information, and for copies of articles on chipping which appeared recently in leading publications. These feature articles describe five methods of brush disposal, and ten new ways to utilize "by-product" chips. Send for your copies, they are well worthwhile.

Plan on *low-cost* disposal of trimmed branches, whether it's for a tree company, utility, highway department, a city, or a park department—plan on getting a Fitchburg Chipper.

This well-engineered and rugged machine turns brush into easy-to-dispose-of chips, at very low cost. Only the Fitchburg Chipper has an exclusive, patented Feed Plate which automatically adjusts for any size brush up to its rated capacity, making it possible to chip large or small material with ease.

This Spring-Activated Feed Plate reduces shock action and horsepower requirements since it permits chipping of larger size wood without extra power. The Feed Plate results in fast, efficient chipping without a heavy, cumbersome fly wheel. The smoother chipping action means lower maintenance, too, as well as greater crew safety.

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presents a concrete surface 3 ft. wide and slightly crowned. The flexible mesh permits shaping to provide left-turn bays at important intersections. The Klemp metal grating is installed by placing clips through openings in the grating and fastening them to the pavement with pins driven to 3-in. penetration by a Ramset fastener. A production-like procedure is followed in the construction of the strip. The grating was delivered on the job, followed by one or more members of the installation crew who laid the grating out following a transit line previously laid out by a survey crew. A second crew member, carrying small clips, placed the tongue end of the clips through openings in the grating. These were located along the sides of the grating at 2-ft. intervals and in the center of the grating at 3-ft. intervals. Next came the fastening crew, consisting of four men—three loading the guns and one firing. After the mesh was in place it was filled with ready-mix concrete. A crew with a vibrating machine and cement-finishing equipment followed immediately behind. Curing compound was next applied and after the concrete was dry, a hot mastic material to seal the joint between the divided

strip and the street surface was applied.

"New Type Median Strip Costs Less, Is Easier to Install." By A. V. Plummer, Assistant to the Supt., Cook County Highway Dept., Chicago, Ill. *The American City*, October, 1959.

Resurfacing County Roads

Cumberland County, New Jersey, has 530 miles of roads of which 460 miles are surface treated gravel. The maintenance of these roads for present day travel is of paramount importance to the welfare of the county. After extensive study of the road conditions, two conclusions have been reached and put into practice. First, more county tax funds must be appropriated; and second, a greater portion of the total county road appropriation must be reserved specifically for a larger annual program of resurfacing. Following these conclusions, the county road system is divided into four classes of roads, ranging from those of greatest importance to the lesser important feeder roads. Approximately 75 miles of roads were resurfaced during 1959 with asphaltic oil and sand-gravel cover, making this year's expenditure for

surface treatment almost \$200,000. An application of CE-RC-3 or CE-RC-4, at the rate of from 0.3 to 0.35 gal. psy, covered with ½-in. broken stone, at the rate of 30 lbs. psy was specified for the treatment work. The work was done by contract and the contractor used a Bit Paver to apply the bituminous material and stone cover in one compact operation. The Bit Paver consists of a 2,000-gal. distributor with a front mounted spray bar and spreader box, so arranged that both the bitumen and the cover material are applied ahead of the front wheels of the distributor.

"Cumberland County Resurfaces 75 Miles of Road." By George M. King, Cumberland County Engineer, Bridgeton, N. J. *Constructioneer*, September 28, 1959.

Downtown Pedestrian Mall

Kalamazoo, Mich., has completed the revamping of its principal shopping area into a grassy, tree-lined, pool-and-shrubbery studded pedestrian mall. The Burdick Street mall extends for almost 1,000 ft. through the city's leading retail shopping street. The merchants were the prime movers in the conception of the mall. A Downtown Kalamazoo

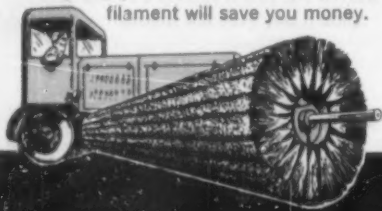
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Planning Committee was formed to begin action on the rejuvenation of the district. They hired a planning consultant to present an evaluation and a program for the future. The report comprised these steps: 1) Construction of a limited access road circling the center of the city to carry peripheral circulation and free the area of unnecessary traffic; 2) creation and gradual expansion of non-vehicular areas, mainly designed as pedestrian malls; 3) removal of unsightly elements such as old warehouses and other outdated buildings; and 4) construction of new parking facilities on the above locations. The plan calls for an ultimate objective of 11,500 parking spaces. The city is paying \$30,000 for construction, plus the cost of a stage, which will be leased back to the merchants. The latter are contributing another \$30,000. This total will not be enough for costs and added funds are being sought. The mall, designed and built by the city's park department, is at the level of the sidewalks. The drainage system runs longitudinally through the area's center; the mall thus was sloped to an average 7-in. depression in the middle.

"Downtown Pedestrian Mall."
Street Engineering, October, 1959.

Curb Removal With Dynamite

On Eastern Blvd., southeast of Baltimore, Md., the concrete curb was extremely difficult to remove, until dynamite was used. The curbing had an 18-in. base width and was about 12 in. high. Test shots made by a blasting company showed that 10-in. deep holes on 24-in. centers would provide good breakage at maximum spacing, when each 1½-in. bore hole was loaded with ¼-strip of DuPont 40 percent Special Gelatin. The entire curb was then drilled down its center-line with vertical bore holes on the 24-in. spacing. The holes were fired in groups of four, ¼ stick in each, all four holes primed with instant caps. Cover was provided by one 12' x 12' one-ton ⅝-in. cable blasting mat, placed by a Gradall. The curb was fractured at a timed rate of one foot per minute, excluding drilling time.

"Fractional-Stick Shooting Speeds Curb Removal." By William F. Hallstead, *Roads and Streets*, October.

Flood Waters Damage City Equipment

Meadville, Pa., faced the job of removing six inches of ice from its streets and sidewalks following the flooding of French Creek. The flood

RIPS WIDEST STUMPS TO SHREDS ... IN MINUTES!



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You'll never know how easy stump removal can be, unless you've seen the Pow-R Stump Cutter in action. Here's the machine that has simplified this expensive, back-breaking, laborious job in cities, parks, golf courses and cemeteries all over the country. A one-man operation ... a real time saver ... a real labor saver! The Pow-R Stump Cutter removes the largest tree stump — rips it to shreds down to a depth of 10" below the ground — all in a matter of minutes. "Removed 44 stumps in 8 hours with the Pow-R-Stump Cutter" ... is the report from one city recently.

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The Vermeer Pow-R Stump Cutter was FIRST ... the original stump remover. It's a quality machine, ruggedly built to take on the toughest, largest stumps. Cuts wider stumps (a full 72") and higher stumps (37" above the ground) at one setting! Operator has full view of cutting wheel at all times ... behind wire mesh safety shield.

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No stump to be hauled away. No gaping holes to fill. No damage to drive-ways, curbs or sidewalks. Get all the details by mailing the coupon below.

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also disabled 50 percent of the street department's equipment. With much of the city equipment disabled, two local contractors furnished equipment to help clear the city of ice. They used bulldozers, graders, loaders and trucks to accomplish the job. The ice was hauled to various areas within and adjacent to the city where it could melt without doing further damage. The entire job took about one week and during that time the various crews hauled 1,000 truck loads of ice. The flood damages reached an estimated \$5,000,000 in Meadville.

"Six Inches of Ice." By Robert Perry, City Engineer, Meadville, Pa. *The American City*, October, 1959.

Other Articles

"Rough Winter Proves Fond du Lac's Snow Program." Pooled equipment, good organization and prearranged plan of attack pay dividends. By R. H. McManus, City Manager, Fond du Lac, Wis. *The American City*, October, 1959.

"The Little Things Add Up to Better Paving." Specifications, standard procedures and details, developed during a continuous paving program, narrows bid ranges and saves dollars. By Charles W. Cook, City Engineer, Alexandria, La. *The American City*, October, 1959.

"Modern Techniques Control Vegetation on Highways." By G. Gordon Fisher. *Roads and Engineering Construction*, September, 1959.

"A Fresh Look at One-Way Street Fundamentals." The author discusses the advantages of one-way streets and the principles governing directional movement of traffic thereon. His suggestion: abolish two-way streets and think of "one-way couplets" and their fullest use in expediting traffic flow. By Bryan Wilson, Traffic Engineer, Wisconsin Division, AAA, Madison, Wisc. *Street Engineering*, October, 1959.

"The Job of the Traffic Engineer—It Lasts the Lifetime of the Road." The job of a traffic engineer in any state highway department has been one in which sincere thinking must be directed toward the welfare of the driver, the vehicle, the roadway and the pedestrian. By A. L. Basile, Engineer of Traffic Services, State Highway Commission of Kansas. *PUBLIC WORKS*, November, 1959.

"High-Speed Flexible Bituminous 'T' Project." Years of looking ahead put contractor in position to secure and successfully execute a 120-day contract for a 20-mile bituminous base and surfacing job in aggregate-scarce western Kansas. By H. K. Glidden. *Roads and Streets*, October, 1959.

"Heating Methods for Safer Roads in Icy Weather." Report on Road Research Laboratory trials with automatic control system. *The Surveyor*, September 26, 1959.



● MODERN fluorescent luminaires such as these "Tee" units installed in downtown McPherson, Kansas, transform gloomy areas into safe and attractive streets.

TWO-YEAR PROGRAM RELIGHTS THIS PROGRESSIVE CITY

THE NEW street lighting system at McPherson, Kansas, is the first major application of the General Electric fluorescent T-lighting system, so called because the three six-foot, four-lamp units on each pole form the letter T. Installation of the modern fluorescent system climaxed a two-year relighting program which brought major lighting improvements to the residential areas, main thoroughfares and intersections, and the downtown section of the city of 10,000 persons.

As a result of the new street lighting, McPherson City officials anticipate reduced nighttime crime, fewer traffic accidents, and better business.

F. D. Diehl, Superintendent of McPherson's Water and Electric Department, pointed out that "good street lighting helps attract desirable new industries." "The fact that good street lighting is a major factor in drastically reducing nighttime accidents is well documented," he added. "There is also strong evidence that good lighting makes enough difference to be counted as an ally against crime."

McPherson's police chief notes that in the first year after installation of the residential lighting, there were no window peepings, house burglaries, or prowlers reported in a neighborhood that averaged 30 cases a year during the previous decade.

First installation completed in the \$378,000 program was in the resi-

dential area where 1,200 incandescent luminaires were turned on in December, 1957.

A total of 474 General Electric "power-pack" mercury-vapor luminaires now light the four main thoroughfares leading to the downtown area and four highway intersections on the outskirts of town.

Last to be installed were the 344 fluorescent units in the downtown area. The 96 three-unit T-lighting installation provides more than 100,000 lumens each. Single fluorescent fixtures are mounted on each of 56 other poles. Maintained illumination in the downtown area is 6.5 foot-candles, which gives McPherson one of the brightest business sections in the nation.

The new lighting system is being financed by revenue from the city's Water and Electric Department with no bond or tax money being involved for the improvement.

• • •

Paving Record Set

Michigan recently laid claim to a national record for laying pavement on the Detroit-Chicago expressway. The Highway Department announced the Pierson Construction Company of Saginaw placed 6,242 lineal feet of 24-ft. wide, 9-in. thick concrete on the Detroit-Chicago expressway, U.S. 12, in a 12-hour working day near Watervliet in Berrien county.



*Today's only
roller with
fold-away
towing
wheels!*



Because hinged towing wheels *fold away* inside the recessed main frame, the KT-8 works in close against buildings, poles, high curbs, and other obstacles *without removing wheels*. Ask Buffalo-Springfield distributor for a demonstration.

NOW...KT8 roller lets you roll within inches of side obstructions

Hydraulically powered towing wheels "fold away" into the main frame to give the *new* 4-6 ton Buffalo-Springfield® Model KT-8 Portable Tandem Roller some unique advantages never before offered in *any other roller!*

The KT-8's exclusive "fold away" feature permits maximum ground clearance... and completely *eliminates excessive overhang!* The KT-8 can work in tight corners... around obstacles... up against high curbs and forms... without removing the wheels. And the new "fold away" design lets the operator actually see his work at all times!

Hydraulically powered towing

wheels save time on every move — speed work schedules. The KT-8 is ready for transporting in *minutes*... and ready to go to work just that fast at the next site!

There are other important features, too. Torque converter drive *automatically* matches power to grade and material variations... permits infinitely variable speeds from 0.5 to 5.3 mph in either direction. Heavy-duty, high-speed, low-torque clutches provide smooth reversing without grabbing. Wide faced bevel gears assure long, trouble-free operation. *The KT-8 is built for maximum performance, dependability and durability in every respect!*



A new 3-5 ton Portable Tandem KT-7A is also available. (No towing attachment.) See your Buffalo-Springfield distributor for a demonstration on either model KT-7A or KT-8.



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150 HP—29,200 lb.



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The No. 14, the industry's first and only Turbocharged Motor Grader, is the most versatile BIG grader ever developed. It operates at the highest practical working speeds with either a 12-foot or 14-foot moldboard. Built to handle the biggest jobs, it will deliver profitably for you on many applications. For example:

1. Power Applications like heavy grading, heavy ditching, rough grading and bank sloping.

2. Control Applications like light spreading, surface maintenance, fine grading and light blading.

The No. 12, known for more than 20 years as the "standard of the industry," has recently been improved to increase its superiority over similar-size graders. Here are some improvements that contribute to its greater capacity:

1. Clearance between the top edge of the blade and bottom edge of the circle has been increased to provide improved rolling action, allow more material to move across the blade.

2. Blade Thickness has been increased and blade beams have been increased in length and thickness to handle heavier loads.

3. New Mechanical Controls for reduced kickback, easier engagement.

4. New Blade Controls feature a positive mechanical lock—exclusive with Caterpillar. When control is in neutral, the power shaft is locked by a set of gear teeth to prevent creeping.

The No. 112 has also been improved recently—including the new blade controls mentioned above. Use the No. 112 on smaller jobs—none can touch it for efficient performance!

These are just some of many features that put Cat Motor Graders out front with higher production at lower operating cost. For the complete picture, see your Caterpillar Dealer. Ask him to demonstrate—just say when and where, he'll be there!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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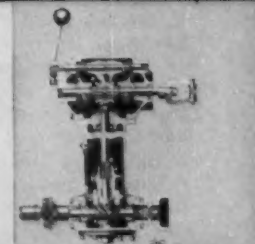
**BEST BUY FOR
YOUR TAX DOLLARS**

HIGH-PRODUCTION FEATURES OF CAT MOTOR GRADERS!

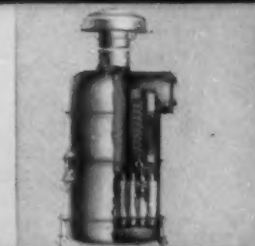
**PREC-O AUTOMATIC
BLADE CONTROL** Optional. Exclusive for Caterpillar Graders. Improves performance on a wide range of applications. Operator selects desired slope on dial. New transistorized for freedom from maintenance and adjustment, the unit automatically maintains blade slope within $\frac{1}{8}$ inch in 10 feet.



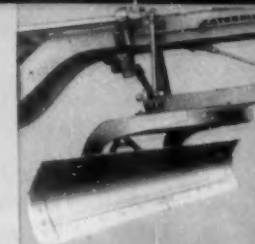
**MECHANICAL BLADE
CONTROLS** Standard. Exclusive, new Caterpillar mechanical blade controls ease engagement, provide precise blade adjustment and reduce kickback. "Anti-creep" lock makes blade stay put under load. Another plus: Operator, while seated, has unobstructed view of job.



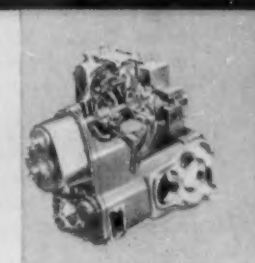
**NEW DRY-TYPE AIR
CLEANER** Most efficient air cleaner ever developed. Removes 99.8% of all dirt from intake air during every service hour. Can be serviced in five minutes. Cuts maintenance time (by as much as 70%) and substantially reduces costs. Extends engine life.



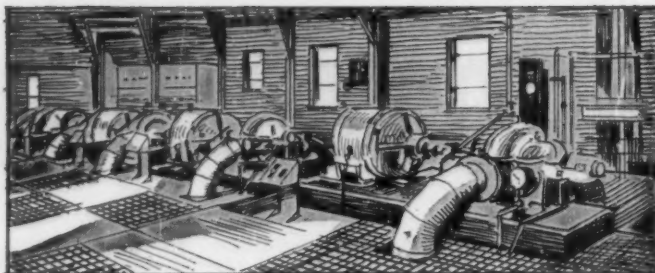
**AMPLE THROAT
CLEARANCE** New design on the No. 14 and No. 12 permits increased clearance between moldboard and circle for maximum loads. Extra strength is built into frame, drawbar and circle to match engine power, absorb the punishment of rough work and assure accurate blading.



OIL CLUTCH Both the No. 14 and No. 12 are equipped with the most advanced clutch design in the industry—proved by millions of hours of use. Provides up to 2,000 hours' service without adjustment, the equivalent of about 12 months of "adjustment free" operation. Virtually eliminates down time for clutch repair.



THE WATER WORKS DIGEST



Prepared by ALVIN R. JACOBSON, Ph. D.

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Electronic Telemetry For Water Systems

One of America's oldest cities, Philadelphia, is now automating its waterworks operations. Installation is being made of an elaborate electronic system that will automatically transmit information from 92 points in the city's water system to 8 key locations. The new system will provide complete operating information instantly, enabling better control of the far-flung water system and at lower cost. This installation is significant because it combines a microwave radio relay system with the control and telemetering facilities. From its present 8-station network, it can be expanded in the future in both breadth (channel accommodations) and length. It is significant, too, because it effects sizable economies and sets an example for other cities. The author has described in detail the many types of electronics equipment available, their function, etc. While the Philadelphia water system's first step toward automation represents an investment of \$432,000, smaller communities can also make moves in this direction at comparably smaller cost.

"Waterworks Move Toward Automation." By Leo G. Sands. PUBLIC WORKS, November, 1959.

Water Works and Power Utility Cooperate

Thirty years ago, the City of Springfield, Mass., and the Turner Falls Power and Electric Co. agreed to use Cobble Mountain Reservoir for the dual purpose of public water supply and power generation. The joint water supply and hydroelectric project seemed especially feasible because of the high head expenditure necessary before the level of the water treatment plant was reached. The contract provided that

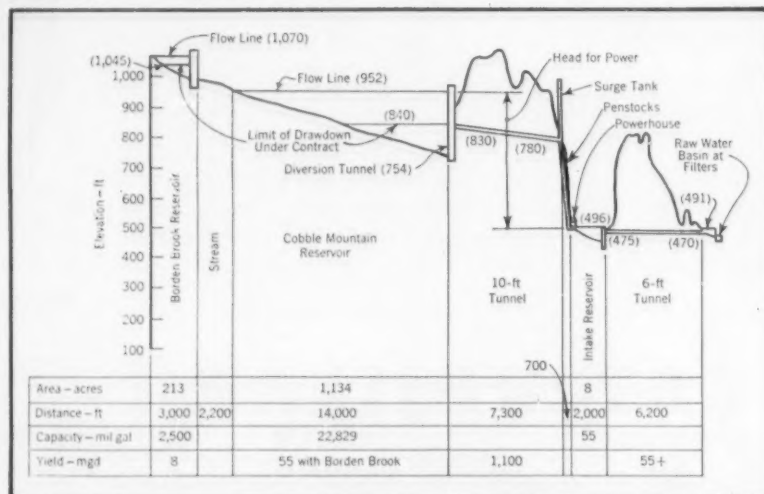
Springfield would construct the dam and outlet pressure tunnel, pay for the power plant and lease the facilities to the power company. The company agreed to build the power plant, to install trash gates, and to build electrical transmission circuits to the city. Further agreement was made fixing the rental at \$270,000, subject to a reduction of \$20,000 when city water use exceeded 30 mgd and additional amounts as use further increased. The revenues to the city for leasing the facilities will have exceeded the financial charges upon the termination of the contract in 1962, by about \$227,000, making the project self-supporting. Taking into consideration the tax loss paid to three Massachusetts towns, a deficit results which makes the project cost \$4 per mg. If the Cobble Mountain project had been developed piecemeal with no power development, the cost would have been \$55 per mg. No operating difficulties have so far been experienced, and the adverse circumstances anticipated by the design have not ma-

terialized. In 1962, the powerhouse and equipment will be restored to the city for further leasing. This should assure the city of a yearly income for financing future improvements.

"Parallel Operation of a Municipal Water Supply and an Electric Utility." By Peter C. Karalekas, Chief Water Engineer, Springfield, Mass., Municipal Water Works. *Journal A.W.W.A.*, October, 1959.

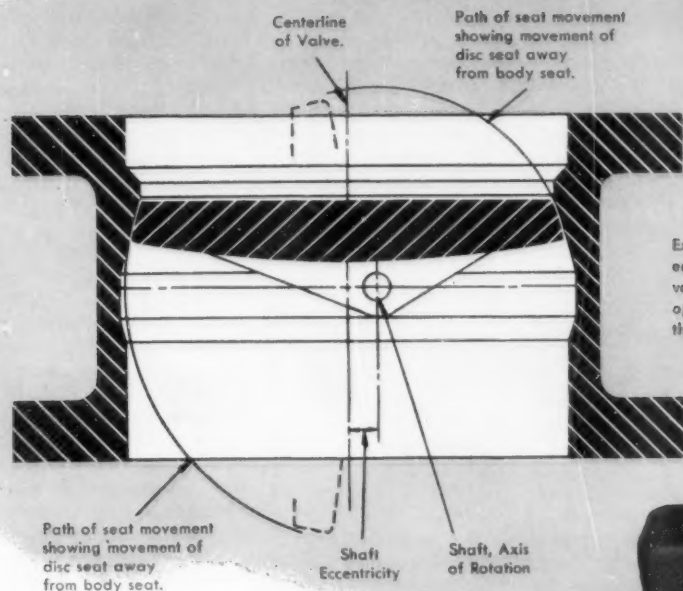
Storm Water Recharge

Since 1935, the County of Nassau, Long Island, N. Y., has been engaged in the construction, maintenance and operation of impounding and storm water artificial recharge basins of one acre or more in size, for the replenishment of ground water as a conservation measure. The recharge basins serve several purposes: 1) They replenish the ground water supply by returning to the ground the storm water runoff from rainfall and melted snow; 2) they provide drainage outlets, without



Courtesy Journal AWWA

● PROFILE showing power head available from Cobble Mountain Reservoir to filters.



Exaggerated diagram showing eccentricity of valve shaft in relation to valve axis and how the disc, upon opening, is lifted from the body seat throughout its entire circumference.

How **DARLING-PELTON** **BUTTERFLY VALVES**

lick common problems!

Problem No. 1—COMPLETE SHUTOFF. With a continuous, 360 degree, rubber sealing ring, uninterrupted by the valve shaft, *drop-tight* shutoff becomes possible!

Problem No. 2—SEAT LIFE. With the valve disc swinging on an axis eccentric to the valve centerline, the disc lifts away from the body seat upon opening—abrasion and distortion are avoided. Moreover seat life is further prolonged by easy, compensative adjustment.

Problem No. 3—MAINTENANCE. Minimized and simplicity itself due to the unique seat ring principle. No sealing problem around the shaft. The rubber seat is replaceable in or out of the line without dismantling the valve!

Get *all* the facts on performance, sizes and constructions made to A.W.W.A. Specifications. Send for Bulletin 5904.

DARLING VALVE & MANUFACTURING CO.

Williamsport 22, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford, Ont.



construction of large conduits to streams or tidewaters; 3) they reduce the size of conduits required for storm water drainage by impounding waters during peak flows; 4) they discharge waste water from air conditioning systems and uncontaminated water used for industrial processing at manufacturing plants. About 100 square miles of the approximate 274 square miles of Nassau County have been found suitable for the salvage of water by these basins. It is estimated that approximately 40 mgd in Nassau

County and 10 mgd in neighboring Suffolk County are being returned to the ground water supply at the present time. Although the earlier recharge reservoirs were constructed as single basins, the later and approved design provides basins consisting of two units of approximately equal size. The first unit serves as a settling basin to remove the sediment which would otherwise prevent percolation into the ground. The second is a seepage or percolation basin and is separated from the first basin by a dike. The two basins

are connected by conduits equipped with control gates. The total capacity of the two basins is designed to store all of the runoff from storms, and seepage from the percolation basin between storms is counted on to empty the basins to prepare them for the next storm frequency.

"Storm Water Recharge On a Wholesale Basis." By W. Fred Welsch. *Water Works Engineering*, October, 1959.

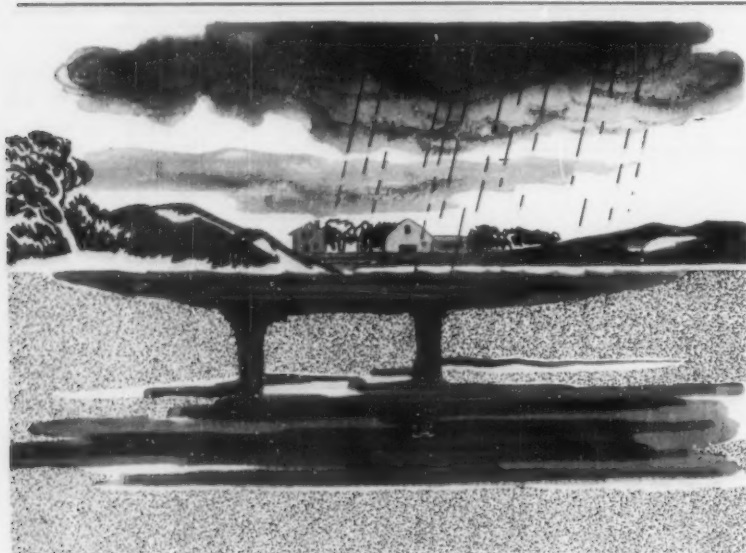
Corrosion Control

Corrosion research workers have used oxygen-depletion tests to measure corrosion rates since nearly the turn of the century. Many of the previous methods of measuring oxygen consumption have been extremely cumbersome and unwieldy. A more flexible and rapid technique for measuring the rate of oxygen absorption by non-destructive testing of the sample was used in these corrosion studies. The apparatus known as the Warburg Respirometer which was applied in this study has been used quite extensively in other scientific fields. Its chief advantages are the extreme flexibility and speed by which many variables can be studied in short-term tests. This paper cites the result of studies on the effectiveness of sodium silicate in corrosion inhibition in steel pipes. It was possible to differentiate the effects of several variables, such as pH, calcium and chloride ion concentrations on corrosion inhibition by silicates. On the basis of the sodium silicate studies it was concluded that the alkalinity which is added with the sodium silicate is not the cause of corrosion inhibition but that the silicate group is the important one. Also the deleterious effects of chloride ions on the corrosion of steel are mitigated by sodium silicate treatment.

"Experimental Studies of Corrosion Control By Silicates." By R. Eliassen, R. T. Skrinkle and W. B. Davis. *Jour. New England W.W.A.*, September, 1959.

Obtaining Ground Water

There was a time, not too many years ago, when location and development of ground water supplies were relatively simple but today the problem is not quite so easily solved. Although test holes are still the safest and most reliable means of securing information, the cost of drilling test holes has so increased that this method is of questionable economy in areas where ground water is scarce. Consequently,



UP-SIDE-DOWN WATER WELLS

There is comfort in the knowledge that today's engineers and water works men are craftsmen thoroughly familiar with the water problem and its remedy.

Extensive experiments are being made to control drought by producing artificial rainfall. "Upside-down wells" are used in some areas with declining water tables, run-off surface water during peak rainfall being injected into the ground through wells. Waste of water through evaporation in some dry areas is as much as eight feet of water per year from reservoir surfaces. Recent experiments in spreading a thin coat of cetyl alcohol on a water reservoir surface reduced evaporation as much as 65%. Considerable progress is being made in research and experiments designed to remove salt from sea-water.

It is no longer true that "much water goeth by the mill which the miller knoweth not of." Water works men know the facts of life so far as water is concerned, but they need public support.

This series is an attempt to put into words some appreciation of the water works men of the United States.



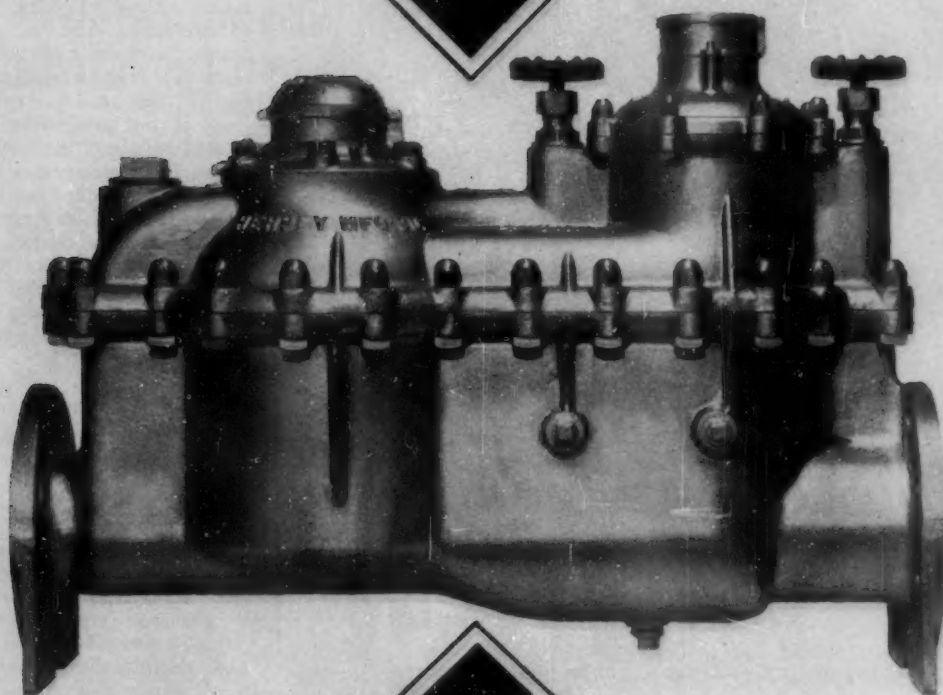
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ANNISTON, ALABAMA



HERSEY COMPOUND METERS

ALL BRONZE CASE 2" to 6" INCLUSIVE

Of course they are the best!
Specified by experienced
water works officials
in all fifty
States



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YOU CAN'T BUY A BETTER WATER METER THAN HERSEY

ground water development experts have taken a few lessons from the oil industry and are now making rather extensive use of other methods of locating and developing underground water. The basic starting point, however, in all such work is a careful study of the general geology of the area. After geologic data have been gathered, the next step is to get all available data from any existing wells in the area. Considerable information about underground conditions can be obtained from an electric log, and at relatively little expense. When there are no avail-

able wells or bored holes in the area, modern prospectors make use of either seismic or electrical-resistivity methods for locating ground water formations, the latter being much more popular than the former method. The electrical-resistivity method has two important advantages over the seismic method in water prospecting: 1) It is considerably less expensive; and 2) it comes closer than other methods to giving direct hydrologic information, because it depends largely on the electrical conductivity of the water itself. By correlating the data ob-

tained from a resistivity survey with other known data, usually with just one test hole in the area, an expert can select the most desirable locations for wells. The next step in a location program is the drilling of test wells to determine potential quality and quantity of water.

"Location and Development of Ground Water Supplies." By Paul J. Kleiser. *Journal A.W.W.A.*, October, 1959.

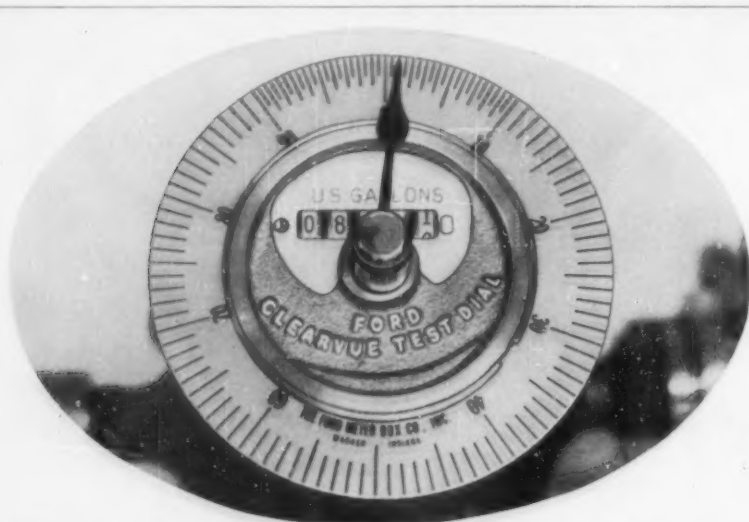
Saline Water

Experimental activity in the demineralization of water and in installation of new plants is going forward at an accelerating rate. Research and development efforts in the U. S. have set price goals based on the present maximum costs for normal water supplies, i.e., about 38 cents per thousand gallons for municipal or domestic uses and 12½ cents per thousand gallons for irrigation uses. At the present time most of the production plants are located outside of the U. S., in places where fresh water is either totally lacking or far more costly than the above figures. Multieffect and multistage distillation systems appear to be receiving the major share of attention at the present time. The first two demonstration plants of the Department of the Interior, as well as the majority of large production plants, are of this type. It is hoped that the cost can be reduced to about one dollar per thousand gallons. It is also likely that vapor compression, with about the same cost limitations, will find early application. Electrodialysis has reached the stage of development where it produces fresh water from brackish water more cheaply than distillation. Ion-exchange processes in general have not received sufficient attention. It is possible that combinations of ion-exchange and thermal or electrical processes could prove more economical than distillation alone. Reversed osmosis, solvent extraction, and some other less well developed phenomena will continue to receive attention but cannot be expected to yield attractive processes for many years into the future.

"Progress in Saline Water Conversion." By Everett D. Howe. *Journal A.W.W.A.*, October, 1959.

Variable-Flow Sand Filters

Improving filtered water quality from rapid sand filters was the objective of the trial run of a revised system of rapid sand filtration that began in August, 1957, at the Wyan-



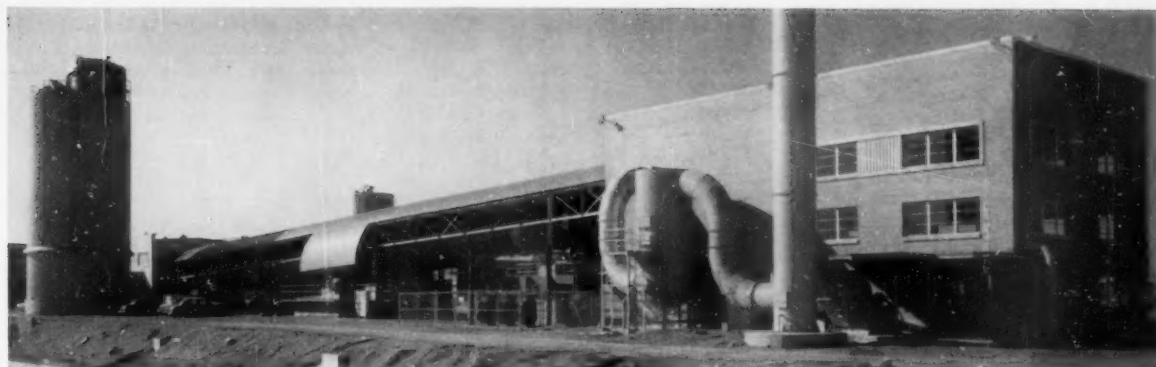
For Accurate Reading of Meters on Test . . .

Meter dials are read accurately . . . down to 1/2 of 1% . . . when equipped with the Ford Clearvue Test Dial. May be used on any straight or round reading register between 2½" and 3" in diameter, except those with a sweep hand in the center. It makes no difference whether meter reads in gallons, cubic feet or liters. Calibrated aluminum ring, 5" in diameter, can be turned to any position for start of test.

THE FORD METER BOX COMPANY, INC.
Webster, Indiana

FOR BETTER WATER SERVICES

FORD



at City of Dayton —

self-amortizing lime recovery plant designed around Magnetic Flow Meters

Up to 150 tons of lime a day can be recovered by Dayton's Lime Recalcining Plant. City expects to get its \$1,330,000 plant investment back in 20 years — plus a surplus estimated in the millions. Consulting Engineers: Black & Associates, Gainesville, Florida.

Dayton, Ohio's million dollar lime recalcining plant would warm the cockles of the thriftiest Scotsman's heart. Designed to recover lime used in softening city water, the plant actually recovers up to 20% more lime than originally added, with additional capacity to process most of the lime sludge accumulated over the last 5 years! City plans to sell the overage — recover its investment in short order.

Dayton's Lime Recalcining Plant was designed around Foxboro Magnetic Flow Meters. Sludge, which would foul-up conventional head-loss devices, is easily measured since these unique meters have no flow restrictions. Measurement is instantaneous—continuous—linear. Rate of flow to centrifuges can be controlled exactly.

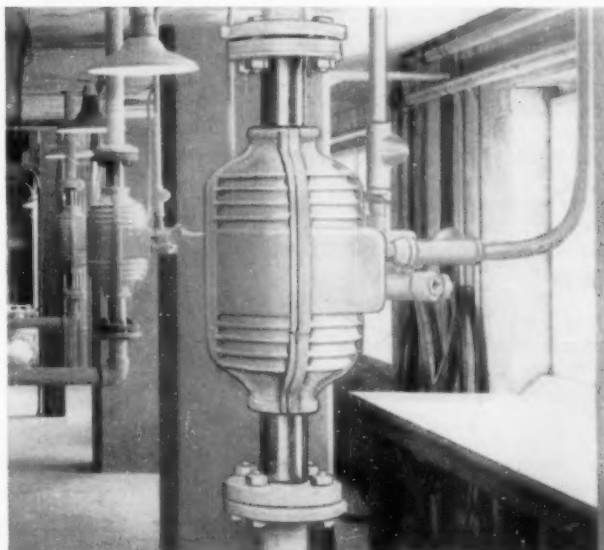
Maintenance on the Magnetic Flow Meter is practically nil. There are no pressure taps to get plugged or frozen . . . no seals or purges . . . no moving parts to foul.

For practically *any* liquid, however "difficult", you'll find the Foxboro Magnetic Flow Meter a sound investment. Find out about this fabulous instrument today. Ask your Foxboro Field Engineer* for details, or write for Bulletin 20-14C. The Foxboro Company, 2612 Norfolk Street, Foxboro, Mass.

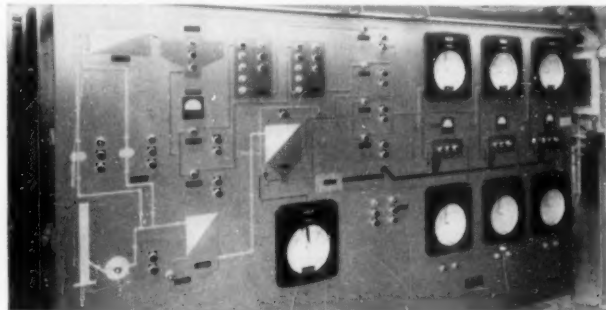
FOXBORO

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**MAGNETIC
FLOW METERS**



Three Foxboro Magnetic Flow Meters record and control the flow of sludge to centrifuges at Dayton's Lime Recalcining Plant. Meters cannot plug up because they have no flow restrictions.



"Graphic control panel in Feed End Building is helpful in breaking in new operators and in explaining the operation to visitors," reports Plant Supt. Robert C. Stout.

dotte, Mich., filtration plant. It was believed that filtered water quality would be improved by designing flow-limiting filter control equipment so that the rate of flow through the filter would decline as the filter became clogged. The work was based on the premise that the quantity of water is dependent on the velocity in the pores of the rapid sand filter. In the conventionally designed plant, the water is forced through the filters with a continually increasing velocity. In the Wyandotte trail set-up the filters were designed to limit the velocity through the pores instead of through the sand bed as a whole. This was done by inserting an orifice plate in the line, in place of the rate controller in one of the filters and comparing the results with one of the filters operated in the conventional manner. Rates of filtration on the two principal test units were very nearly equal. The overall averages show that filter runs on the variable rate unit were 22 percent longer than on the constant rate unit, and the wash water requirements were accordingly smaller. The most important observation was that the concentration of suspended matter in the filtered effluent from the variable rate unit was uniformly 20 percent lower than from the constant rate unit. On the basis of these results, the management of the Wyandotte plant is planning to operate all the filters on the variable rate system.

"Simplified Rapid Sand Filter System." By H. E. Hudson and G. Hazey. *Water and Sewage Works*, October, 1959.

Other Articles

"Effects of Synthetic Detergents on Water Supplies." A report of Task Group 2661 P—Synthetic Detergents Effect on Water Supplies by Paul Haney, Chairman. *Journal A.W.W.A.*, October, 1959.

"Ferric Sulfate Coagulation in the Presence of Synthetic Detergents." A study of the effects of synthetic-detergent components on coagulation with ferric sulfate and includes a detailed study of the removal of surfactants. By J. M. Cohen, G. A. Rourke, and R. L. Woodward. *Journal A.W.W.A.*, October, 1959.

"Better Water at Lower Cost Through Improved Treatment." The authors have taken an inventory of current water treatment methods and evaluated them in terms of past practices. By Edward S. Hopkins and Carl J. Lauter. *Water Works Engineering*, October, 1959.

"Water Works Accounting." A paper stating the basic principles of water-

works accounting. By Richard G. Small. *Journal New England W.W.A.*, September, 1959.

"Prestressed Concrete Standpipe." A new 2.95 million gallon prestressed concrete standpipe, completed for Sayreville, N. J. *PUBLIC WORKS*, November, 1959.

"Should Hoopes Reservoir Become a Public Playland?" Wilmington, Del. water department answers public demand with warning against opening area for general recreational purposes. A Water Department report to the Board of Water Commissioners. *Water Works Engineering*, October, 1959.

MODERNIZED WATER FILTRATION PLANT FEATURES PUSHBUTTON MOTIF

PART of an overall plan for modernization of Philadelphia's water system, the automatically programmed Torresdale water treatment plant was placed in operation in September. Built at a cost of \$25 million, the new treatment unit will handle an average flow of 282 mgd, with a maximum hydraulic loading of 423 mgd. It replaces a slow sand filter installation in use at the same site for the past 50 years.

Functionally, the plant design is conventional with rapid mix, flocculation, sedimentation, filtration, disinfection, and fluoridation. Controls involve electronic and pneumatic systems affecting flow, chemical handling, and filter operation, in an effort to take advantage of every opportunity to provide efficient operation with a minimum of manpower.

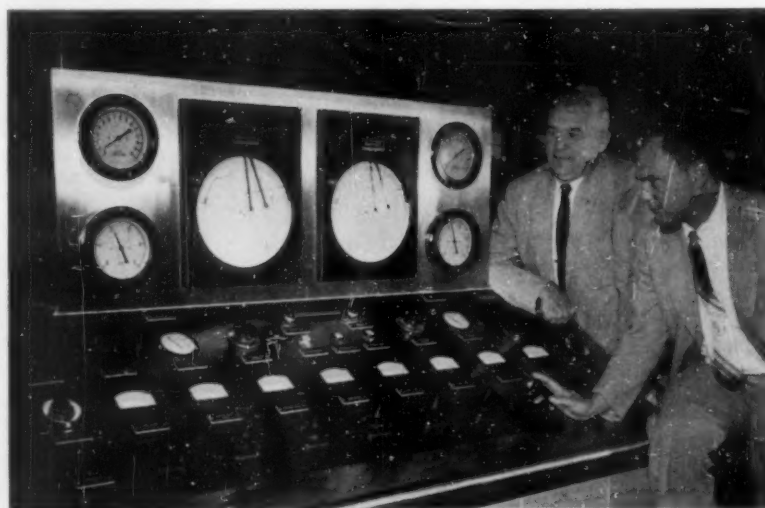
The filters are operated from 46 consoles or from a master panel. With attainment of a predetermined head loss in a filter run, an alarm is sounded to signal the operator that backwashing is needed. He pushes a button, thereby starting the washing sequence, consisting of

closing the influent valves to drop the water level on the filter, closing the effluent valve, opening the drain, starting the surface wash, and opening the backwash valve. After a predetermined time interval, the filter is placed back into operation and pneumatically actuated rate controllers take over to start a new cycle.

Facilities are available for feeding dry or liquid alum, pebble lime, chlorine and chlorine dioxide, activated carbon and hydrofluosilicic acid. Instrumentation is provided for automatic proportioning of chemical addition to influent flow, for automatic weighing, and for monitoring the operation of feeders and indicating levels in storage containers.

A feature of the plant is its continually dry pipe gallery made possible by automatically controlled dehumidification.

The Torresdale plant is the first of three automated water treatment plants to be built in Philadelphia. The old installations at Queen Lane and Belmont are under reconstruction and are expected to be in operation by 1962.



● NERVE CENTER of Philadelphia's Torresdale filtration plant has 48 consoled instruments that automatically program cleaning of 94 filters. Water Commissioner Samuel S. Baxter (l.) and Plant Supt. John Dillener look over one of the consoles.

MATHEWS HYDRANTS

THE MATHEWS MODERNIZED HYDRANT
SUPPLIES THE 4 FUNDAMENTAL
REQUIREMENTS FOR
EFFECTIVE COMMUNITY PROTECTION

and many other quality features, too



Replaceable barrel for maximum efficiency—quickly replaced in case of accident without excavating



Head revolves 360°; simply loosen bolts and rotate

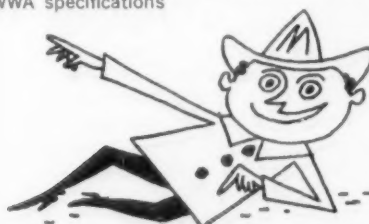


Stuffing box plate cast integrally with nozzle section—eliminates extra part and provides positive, leakproof construction



Operating thread, protected by stuffing box plate, operates free of rust, sediment and ice

Also . . . Nozzle sections supplied with hose or pumper outlets as specified • Operating thread cannot be bent • Compression-type main valve prevents broken Mathews from leaking • Nozzle level can be raised or lowered without excavating • Bell, mechanical-joint, or flange-type pipe connections • Conventional or "O" ring packings • Meet all requirements of AWWA specifications



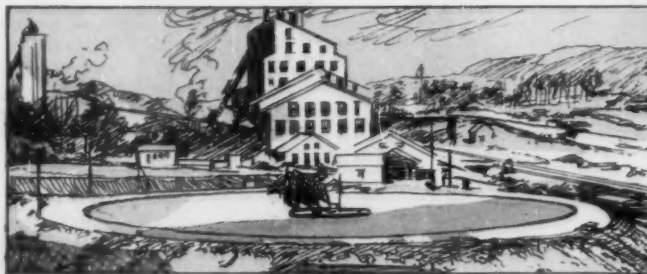
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R. D. WOOD COMPANY

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

THE INDUSTRIAL WASTE DIGEST



Prepared by **CLAYTON H. BILLINGS**, Associate Editor

Bench-Scale Techniques for Design

When compared with the flow-through principle of aeration tank design, the complete mixing approach for activated sludge treatment of industrial wastes offers several advantages. A bench-scale apparatus known as a continuously-fed oxygen utilometer can be used for development of design data for this type of activated sludge system, by permitting estimation of oxygen requirements, BOD removal and production of volatile solids. The utilometer consists of a resin kettle containing the aeration mixture with controlled feed and facilities for continual recirculation of air and replacement of oxygen. The rate of oxygen demand is determined directly after equilibrium is achieved in the utilometer between the aeration mixture and food supply. To determine the amount of oxygen required, the COD removed is observed by analysis of filtered samples of the effluent and aeration mixture and a clarified sample of the feed. The net COD balance related to oxygen uptake defines oxygen demand, the quantity of sludge produced can be calculated from the COD and oxygen uptake data obtained and from a solids balance around the aeration mixture.

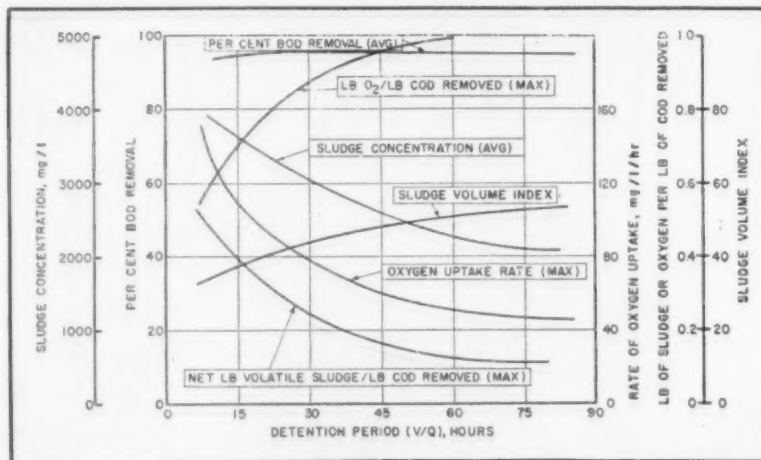
"Design Data for Completely-Mixed Activated Sludge Treatment." By Vernon T. Stack, Jr. and Richard A. Conway, Union Carbide Chemicals Co., *Sewage and Industrial Wastes*, October, 1959.

Anticipating Industrial Waste Loads

While Dallas had enacted an ordinance at the time of inception of the sewer system, it was deemed strict and unreasonable with respect to industrial effluents. The result was that the city was allowed to

grow to a sizeable community without adequate control of industrial wastes. In 1955 a survey was made to evaluate the problem from the standpoint of all major industries. It was found that some 20 industries were contributing 30 percent of the total suspended solids and an increase in strength of sewage received at the plant from 16.7 percent to 62.4 percent above normal in 1958. Daily variations in concentration showed peaks of 400 ppm during the week compared with 250 to 300 ppm on weekends. To check the conclusion that the high BOD was caused by the industrial load, the neighboring community of Farmers Branch was surveyed and found to have an average BOD of 165 ppm. To offset any argument that the load increase was caused by household garbage grinders, a check was made of sewage strength from an addition which was 100 percent equipped with grinders. The sewage from this area was found to have an average BOD of 188 ppm and suspended solids of 164 ppm. A new industrial

wastes ordinance was drafted limiting toxic wastes and requiring pretreatment of materials causing unusual concentrations of solids, excessive discoloration, immediate high oxygen demand or high hydrogen sulfide content. The normal strength of Dallas sewage was defined as 325 ppm BOD and 325 ppm suspended solids. Any effluent exceeding these limits but which did not contain prohibited materials was allowed to be discharged into the sewer system if a surcharge payment was made. The surcharge rate was fixed at \$0.063 per ppm per million gallons per month, based on the amortized cost of settling tanks, trickling filters and digesters, per unit of capacity. The ordinance was submitted to all industries, commercial and professional organizations for comments. Nearly a year was given to industry to correct its problems and to negotiate surcharge contracts. The ordinance was enacted without opposition. The fact that the Dallas sewer utility is completely revenue-supported and received no tax in-



● DATA obtained from the continuously-fed oxygen utilometer, organized to develop suitable design factors for activated sludge treatment of an organic chemical waste.



***"it's true; now "K&M" offers one-stop shopping
for both asbestos-cement and plastic pipe!"***

"K&M" adds 4 types of plastic pipe to its quality line of Asbestos-Cement Pipe! No need any more to buy quality Asbestos-Cement Pipe from "K&M" . . . and then expend time and energy shopping for Plastic Pipe elsewhere. Now, it's as easy as shopping in a supermarket! Get both types of pipe from the source you've always been able to rely on: "K&M"! But, that's not all! You can also simplify planning by fitting both "K&M" Asbestos-Cement and "K&M" Plastic Pipe into the same system . . . custom-tailoring it to your design and your budget requirements. You can get tough, thrifty "K&M" Plastic Pipe and Fittings at all "K&M" factory locations.

Write today for these informative and illustrated brochures . . . packed with facts on each type of new "K&M" Plastic Pipe!



"K&M" Acrylonitrile Butadiene Styrene Pipe
"K&M" Polyethylene Pipe
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KEASBEY & MATTISON
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come made the job of selling a surcharge easier than if tax money had been involved.

"Advice to Cities: Get Ready for Industrial Wastes Loads." By Henry J. Graeser, Superintendent, Dallas City Water Works. *Wastes Engineering*, October, 1959.

Controlling Sulfur Dioxide Emissions

Historically the bad reputation of sulfur dioxide as an air pollutant is based on its identification in the air during the London, Donora and Meuse Valley disasters. Official reports and experimental evidence,

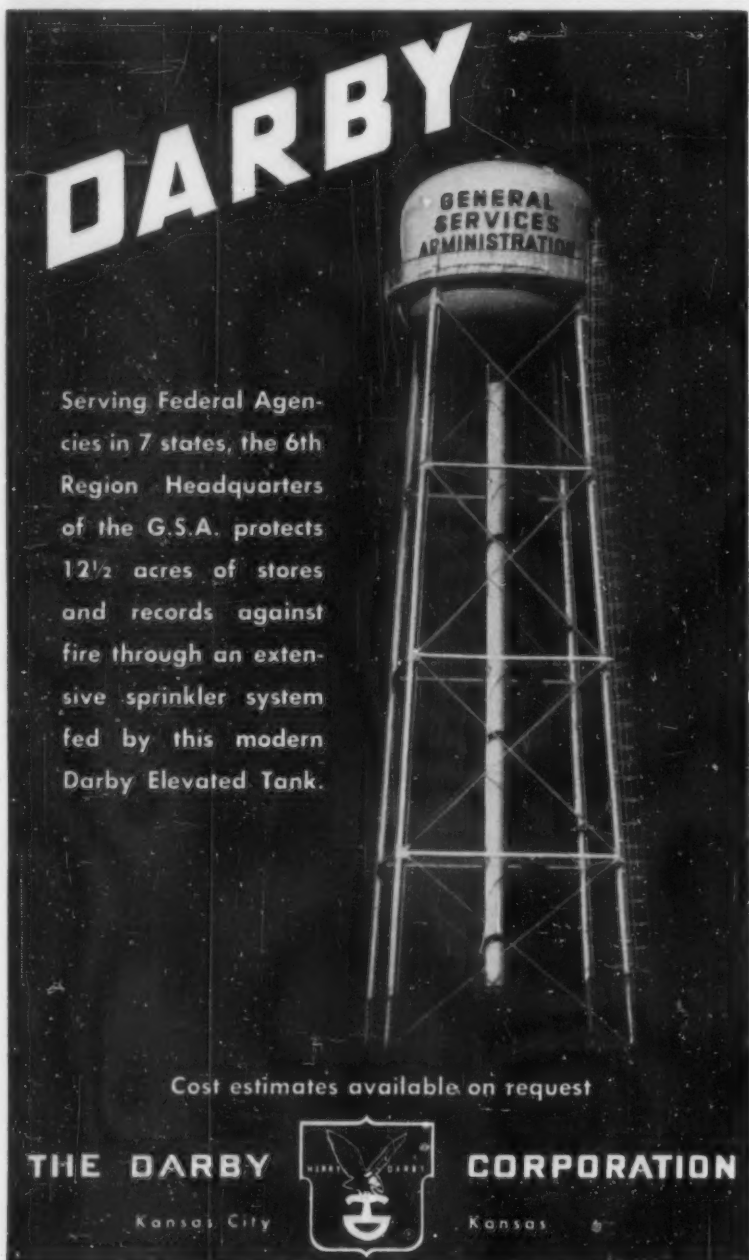
however, have failed to establish any clear cut relationship between sulfur dioxide in moderately high atmospheric concentrations and human illness. Also, it appears that the danger of conversion of sulfur dioxide to hazardous concentrations of sulfuric acid mist has been over-emphasized. Despite the lack of clear cut public health reasons, few will argue the value of eliminating sulfur dioxide as an air pollutant if it can be economically justified. Of two possible methods of restricting the sulfur content of fuels (by treatment or by substitution of alternate fuels), the former is not feasible and

the latter presents the possibility of unfavorable economic results. Legislation recently passed in Los Angeles has prohibited seasonal burning of high-sulfur fuel oil. It is believed in time that serious dislocations in the petroleum industry will result from this regulation with abandonment of low-gravity oil production in Southern California and with higher prices all along the line. Economic consideration has forestalled the installation of proposed methods of treatment of stack gases, with the cost estimated at \$1.24 to \$1.93 per ton of coal burned for treatment of gases with limestone. In the long run, however, industry will have to curtail sulfur dioxide emissions to satisfy public reaction, regardless of scientific justification. Therefore, a high priority should be given to research efforts to desulfurize fuels and to treat stack gases.

"Sulfur Dioxide Furor." By W. L. Faith, Managing Director, Air Pollution Foundation, San Marino, Calif. *Industrial Wastes*, September, 1959.

Waste Sulfite Oxidation

The Chicago plant of the Sherwin-Williams Co. in cooperation with the Metropolitan Sanitary District of Greater Chicago undertook a joint investigation of the feasibility of oxidizing waste sulfite liquors, a waste problem of the company. The liquors were derived from their 2-naphthol and p-cresol units. The concentration of sulfite ranges from 10 to 20 percent. The p-cresol liquor contains cresols, phenols and allied material thought to be antioxidants. The 2-naphthol liquor is free of such substances. Laboratory experiments were conducted using circulation of the waste through a packed column counter-current to the flow of oxygen or air. These indicated that cobalt chloride is an effective catalyst for accelerating the oxidation of sulfite liquors; dissolved salts depress oxidation; dilution increased the rate of oxidation by counteracting the effect of the dissolved salts; naturally occurring inhibitors such as dihydroxyl compounds prevent efficient use of dissolved oxygen; and surfactants accelerate oxygen transfer. Semi-pilot plant investigations were made to determine the practicability of oxidizing the wastes on a continuous basis by using a Mixco aerator and a Yeomans Cavitator, the former utilizing diffused air and mechanical dispersion and the latter depending on establishing regions of cavitation with a rapidly moving rotor. The efficiency of gas



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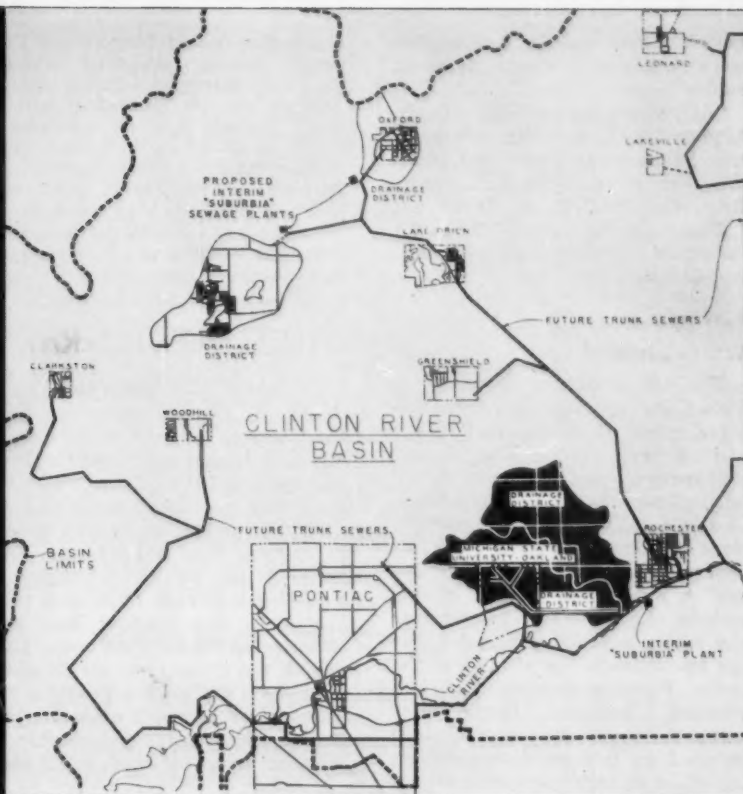
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public works
officials
cleared the
way for
development
of Oakland
County,
Michigan**



**MR. HAROLD K. SCHONE, DIRECTOR
DEPARTMENT OF PUBLIC WORKS
OAKLAND COUNTY, MICHIGAN**

An important by-product of Oakland County's "master-plan" stands, shining and splendid, near the city of Pontiac. It is Michigan State University's new Oakland Branch. The college—serving 3,000 students—and its 700-home community would have been impossible without the foresight of Harold K. Schone and his Department of Public Works. And, as suppliers of "Suburbia" sewage treatment plants, we are proud to have played our modest part in implementing his plan.

Michigan's Clinton River Basin includes about 220 square miles—all directly in the path of expansion from Metropolitan Detroit. Until this year, however, area-wide sewage disposal was rural in nature... hardly designed for intensive population. Yet, with a 42% increase since 1950 and 66% expected by 1960, Public Works Director Harold K. Schone knew something had to be done—and he did it!

Working under authority of the Clinton River Sewage Disposal System, created by the County Board of Supervisors, Mr. Schone's Department of Public Works prepared a comprehensive, area-wide "master-plan." With it, Oakland County will be ready for the inevitable army of increased population.

Essentially, the master-plan involves construction of a number of independent sewage collection and treatment systems, which will eventually merge with one another. The key to this plan is "Suburbia," a low-cost sewage treatment plant which can be planned for projects of 100 to as many as 10,000 homes.

Because they are individually designed, under direction of his engineers, Mr. Schone's "Suburbia" installations conform to State Department of Health requirements. Because they can be erected in a surprisingly short time, "Suburbia" plants can be ready to go "on-stream" almost as soon as sewage lines are completed.

Eventually, all lines will tie into a major sewage treatment plant (when the County can afford to spend from 5 to 20 million dollars); but even then, the "Suburbia" plants can be dismantled and moved upstream to new trouble spots—with virtually complete salvage.

Best of all, "Suburbia" involves less initial and operating capital than any other type of sewage treatment plant. In Oakland County's case, the factor of relatively low cost made it possible to obtain good private financial backing. "Suburbia" is furnished and installed, on a turnkey basis only, by...



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transfer and power consumption were measured in treatment of the sulfite liquor.

"Air Oxidation of Waste Sulfite Liquors." By E. Hurwitz, Metropolitan Sanitary District of Greater Chicago; E. Ciabettari, Yeomans Bros. Co.; and R. A. Wolff and I. Bernstein, Sherwin-Williams Co. *Industrial and Engineering Chemistry*, October, 1959.

Salt Domes for Waste Disposal

The use of natural massive salt formations appears to be feasible for disposal of reactor fuel wastes and similar radioactive wastes that require containment for several generations. One factor in the design of salt cavities for waste containment is protection against generated heat resulting from radioisotope decay. A model was studied by the authors to estimate temperature rise within a salt cavity and in the salt formation in the vicinity of the cavity. Previous investigations had assumed uniform temperatures within the cavity. The investigations reported in this article encompass the effect of vapor space in a partially filled cavity and temperature distribution in space and time, and methods were developed for computing these results. From the observations it was concluded that cavities much in excess of 30 ft. in radius will produce temperature increases in the waste probably beyond permissible limits; that the waste should be diluted to reduce the temperature rise rather than partially filling the cavity with undiluted waste; and that the temperatures are sensitive to changes in the values of the physical parameters such as densities of the liquid and gas and their respective heat capacities.

"Thermal Considerations in the Storage of Radioactive Wastes in Salt Formations." By R. S. Schechter and E. F. Gloyne, University of Texas. *Sewage and Industrial Wastes*, October, 1959.

Other Articles

"Physical and Chemical Properties of Nuclear Power Reactor Waste Solutions." By W. J. Lacy, F. M. Empson, and I. R. Higgins. The composition and characteristics of high-level radioactive liquid wastes from chemical processing of important types of reactor fuel elements are discussed. *Industrial and Engineering Chemistry*, October, 1959.

"Iodometric Microdetermination of Organic Oxidants and Ozone." By B. E. Saltzman, U. S. Public Health Service

and Nathan Gilbert, University of Cincinnati. Kinetic colorimetry methods have been developed which should be valuable for differentiating natural smog oxidant into its components. *Analytical Chemistry*, November, 1959.

"Fish Meal Fertilizer Wastes." By Fred S. Gallagher, H. W. Smith, Inc. Recovery of soluble materials in process and wash water in the menhaden byproduct industry was once a pollution abatement measure but now ac-

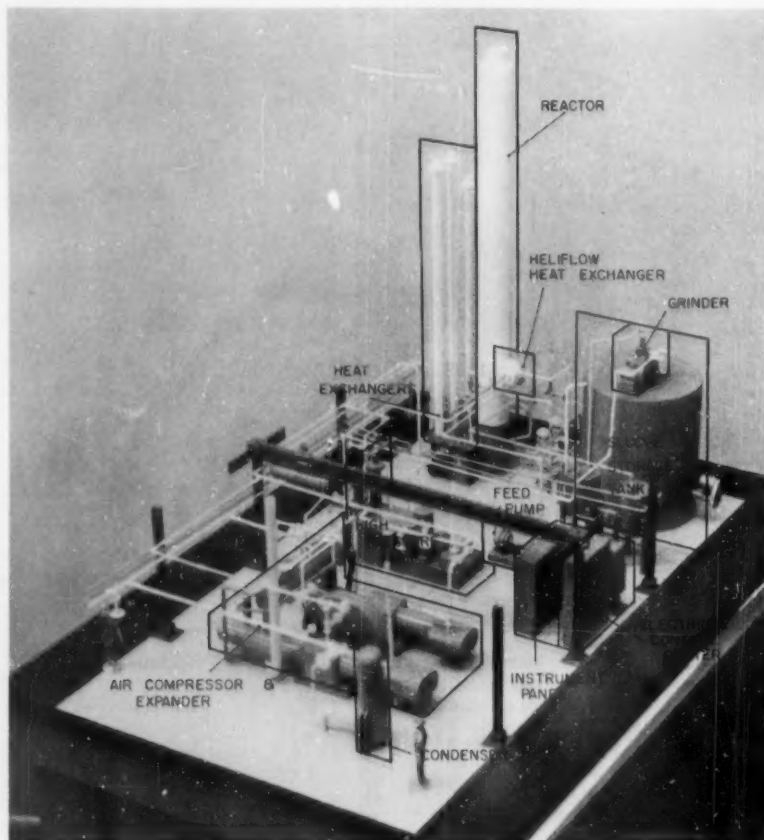
counts for 20 to 25 percent of the total production value. *Industrial Wastes*, September, 1959.

"Radioisotope Wastes Handling." By H. Gladys Swope, Argonne National Laboratory. New waste problems resulting from the use of radioisotopes by industry are discussed, and treatment methods used at the Argonne National Laboratory for handling low level radioactive wastes are described. *Sewage and Industrial Wastes*, October, 1959.

WHEELING TO USE ZIMMERMANN PROCESS

THE SANITARY Board of Wheeling, W. Va., has contracted with the Sterling Drug Co. to design, equip, and build a Zimmermann Process plant to handle 5.6 tons of sewage sludge per day. The process involves oxidation of organic matter by applying heat and pressure. Raw sludge is fed through a grinder to a 6,000-gal. storage tank. It is preheated in the Heliflow heat exchangers and is pumped under 1200 psig in the presence of air to additional heat exchangers to attain the temperature at which oxidation begins. It then enters the reactor, a pressure vessel in which the sludge

is retained until oxidation is completed. A compressor-expander is used, equipped with power cylinders and air compression cylinders operating on the same crankshaft. The compressor supplies air for the process, and the expander power cylinders recover power from gases issuing from the reactor. A condenser is employed to cool the exhaust from the expander before the gases are discharged to the atmosphere. The system is automatically controlled with the assistance of an instrument panel and control center. Completion of the plant is expected late in 1960.



● SCALE MODEL of the Zimmermann Process unit being constructed for treatment of sewage sludge at Wheeling, W. Va. Design capacity is 5.6 tons of solids per day.

LETTERS

TO
THE EDITOR

AUTOMATION IN WATER WORKS

In your October, 1959, issue, you publicize a telemetering project for the City of Milwaukee. The article by Alan Vink of Fischer & Porter claims it is the first such installation. In 1957 the City of Albuquerque spent one-half million dollars and has since added one-fifth million to its telemetering system. We have fifty-eight points of information including flow rates, pressures, reservoir levels, operating conditions and even bearing temperatures.

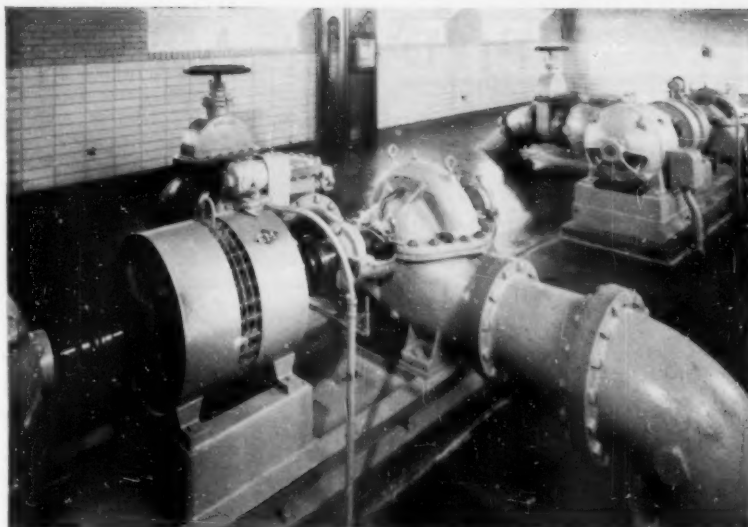
Our system is the largest and earliest.

Conrad Gonzales
Water Engineer
Albuquerque, N. M.

QUALIFIED MEN WILL BE AVAILABLE

The Civil Engineer Corps of the Navy is going to lose the services of a number of very able, experienced officers because of the critical Navy problem of too many officers in the senior grades. These officers, men in their 40's and 50's, are going to have to retire to take care of the "hump" in our officer members, and to provide opportunities for the advancement of our junior officers.

The officers who are retiring have excellent educational backgrounds, and a wealth of experience in civilian and military life. Most of them are registered civil engineers. They have an unusual background not only in engineering and construction, but in the many problems of planning for the design, construction and maintenance of the vast naval shore establishment. They are particularly well qualified for positions with cities and towns as Directors of Public Works, City Engineers, etc. They would be most helpful to States which have, or want to set up, industry-attraction programs. They have broad experience in maintenance, highway



E-M Ampli-Speed Drives provide Odessa, Texas Municipal Sewage Plant with adjustable pumping rate of 1 to 5.4 MGD. Pumps are held to $\pm 2\%$ of manually selected speeds.

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OBJECTIVE: They needed a new, efficient sewage pumping station at minimum cost, with provision for future capacity.

SOLUTION: Odessa officials called in Parkhill, Smith & Cooper, consulting engineers of Lubbock, Texas. P. S. & C. suggested two alternatives: 1. Build a plant with three pumps, including one for peaking and standby; or 2. Install two pumps with E-M Ampli-Speed Drives.

Parkhill, Smith & Cooper favored the 2-pump plan for these reasons:

Minimum Capital Investment. The three-pump plan would tie up a considerable amount of capital in an extra pump, motor and control without adding appreciably to the

volume of sewage pumped.

100% Peak Standby Capacity. Two pumps with E-M Ampli-Speeds could handle present demand efficiently, yet still have enough reserve capacity for 100% peak standby.

Low Cost Expansion. Later another pump could be added to double the station capacity and still allow 100% peak standby. And as a further saving, the building would not have to be enlarged to accommodate this third pump.

RESULT: Odessa took the advice of its consulting engineers and is now enjoying efficient, low cost pumping.

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SEE PAGES 33 to 50

work, civil defense, administration and management.

We are taking this means of calling to your attention the qualifications of these outstanding men in order that you will know of their availability for employment. If you have positions you are planning to fill in the next few months, I will appreciate the opportunity of recommending some of our officers for your consideration.

E. J. Peltier

Rear Admiral, CEC, USN
Chief of Civil Engineers
Dept. of the Navy
Washington, D. C.

NEWS OF ENGINEERS

PAUL EHRENFEST has become an associate of Willard F. Schade & Associates, consulting sanitary engineers, Cleveland, Ohio.

W. D. HOLMES has been made vice-president and general manager of

the Kankakee, Ill., Water Company. Mr. Holmes, who has been assistant manager and treasurer, succeeds L. O. MINOR who retires on Jan. 1.

R. C. MOULENBELT and V. W. SEIFERT have joined the firm of W. I. Barrows and Associates, consulting engineers of Dayton, Ohio, providing expanded service in water supply, waste and power.

BEN C. MCGAHEY has been elected Chairman of the Dade County, Fla., Metro Commission, the 11-man governing body to coordinate work in the Miami Metropolitan and suburban area.

WILLIAM G. HAMLIN, formerly in the field of sanitary engineering consulting, has joined the Training Program staff of the Robert A. Taft Sanitary Engineering Center at Cincinnati, O.

V. B. BANDJUNIS, former Navy Public Works Officer of Chelsea, Mass., has joined the staff of Benjamin E. Beavin Co., consulting engineers of Baltimore, Md.

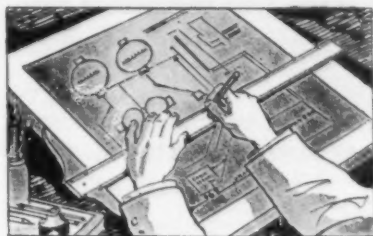
Top Professional Award for Steel Bridge Design

WINNER of \$15,000 in the Steel Highway Bridge Design Competition sponsored by American Bridge Division, U. S. Steel, Allan M. Beesing (right), points out key features of his prize-winning design to A. J. Paddock, president of American Bridge. Mr. Beesing is a registered professional engineer associated with James J. MacDonald, a consulting engineer of Buffalo, New York. The competition, which offered 15 professional and student awards

totaling \$44,000, attracted 300 entries from this nation and abroad. It was conducted and judged under the auspices of the American Institute of Steel Construction. Object of the competition was "to stimulate more imaginative, effective and economical use of modern, high strength steels in overpass structures." It is estimated that more than 41,000 bridges will be needed for interstate and defense highways in the next 15 years.



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PUBLIC WORKS MAGAZINE

200 So. Broad St., Ridgewood, N.J.

**Metropolitan Government
for Seattle**

(Continued from page 121)

discharge of untreated sewage into Lake Washington. The report was released in March, 1958, and gave an estimated total cost of \$164,000,000 for the entire project up to 1980. This gave the Metro Council a long-range blue-print to work from.

The new Metropolitan Council held its first meeting on Oct. 1, 1958. It consisted of 15 members representing the component cities and the county. A chairman was chosen and a competent director was appointed. The Council has been meeting monthly ever since.

The Metropolitan Council has borrowed \$100,000 from King County and \$395,000 from the federal government to start drafting plans for the first construction stage of the metropolitan sewage disposal system to cost \$50,000,000. These loans will be paid back from assessments against cities for their share of the disposal cost.

In conclusion, the citizens of Seattle's metropolitan area no longer have to watch with frustration the growing and menacing problems from "exploding suburbs". During the past seven years they have studied the dilemma, formulated a remedy, obtained an enabling act from the legislature, secured the assent of the voters and have established the new Municipality of Metropolitan Seattle to cope with this problem. This new public agency now is at work on the most serious of all these problems, sewage disposal. But from time to time in the future, it will take on, as the need arises, the additional public services of garbage disposal, mass transportation, planning and parks and recreation, as permitted by statute. This can be done by the assent of the councils of the cities or by the votes of the citizens.

The members of the Municipal League of Seattle and King County, and particularly those who participated in this program, derive great satisfaction from the conspicuous part which this organization of citizens played in this major local governmental reform.

• • •

Water Coagulation

(Continued from page 115)

It should be noted that the chemical dosages required in jar testing are usually very slightly higher than those required in the plant and that, in the case of softening plants, hard-

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ness reduction in jar tests is never
as great as in the plant.

Alkalinity and Hardness Tests. It
was previously shown that alkalinity
must be present in the water, either
naturally or added in the form of
lime, soda ash, or caustic soda, in
order to produce the aluminum or
iron hydroxide floc. Alkalinity of
water is determined by using phe-
nolphthalein and methyl orange
indicators and titrating with stand-
ard acid. The total hardness test is
important to water softening instal-
lations as, together with the alkali-
nity titrations, they permit calcu-
lation of many of the salts present
in water. The reagents required and
the chemistry and calculations in-
volved are clearly stated by Cosens
(8).

For water deficient in alkalinity,
the following calculation may be
used:

The theoretical requirement ratio
of lime or soda ash to coagulant
(alum) is 4.5 mg/L of the alkali
for every 10 mg/L of coagulant.

1) Alum Dosage in mg/L/10 x
4.5 = mg/L of alkali required by
alum dosage.

2) By titration, determine natural
alkalinity present in the water.

3) The difference between the re-
sult of the calculation and the re-
sults of the titration is the theoreti-
cal alkali requirement to be made
up by the addition of lime or soda
ash.

It is desirable to have some ex-
cess alkalinity in the finished water.
This excess should be added to the
amount computed above.

Turbidity. To the water plant
chemist, turbidity is of interest in
the raw, clarified water and filtered
water. Changes in raw water tur-
bidity can serve as a warning that
adjustments in treatment may be-
come necessary. Increases in set-
tled water turbidities may indicate
chemical treatment inaccuracies or
mechanical trouble. Filtered water
turbidities, when correlated with
headloss and filter run figures, give
a good indication of filter perform-
ance and condition. A number of
optical and photoelectric instru-
ments are commercially available
for turbidity measurements. Stand-
ard Methods (9) prescribes the use
of the Jackson Candle method or
correlation of turbidimeter stand-
ards with the Jackson Candle.

Summary

Municipal and industrial water
plants are faced with a continuous
demand for more and better water
making it necessary to use all the

tools available to satisfy that demand. Few water plants are in the fortunate position of not being subject to, at least, temporary problems. Laboratory work, accurately performed, will contribute much to consistently good operation. Coagulant aids may be able to overcome these problems so that, when in the future similar conditions arise, they can be solved without sacrificing water quality or quantity. The use of coagulant aids will, in most cases, promote faster floc formation, growth and settling rate, imparting to the coagulant floc the characteristic essential for good, uniform operation of the clarification equipment. Coagulant aids are applicable in clarification and in cold process softening. They are simple to apply, economical to use and of considerable value in overcoming problems created by lack of capacity, color, and variable raw water conditions. The value of an aid to coagulation can be established by laboratory jar tests when these tests are performed in such a manner as to duplicate normal and abnormal operating conditions.

Bibliography

1. Hoover, Charles P.; *Water Supply and Treatment*; National Lime Association.
2. Hatch, G. B.; and Rice, Owen; "Corrosion Control and Scale Prevention"; *Industrial and Engineering Chemistry*, August, 1945.
3. Baylis, John R.; "Silicates as Aids to Coagulation"; *Journal AWWA*, 1937.
4. Langlier, W. F.; and Ludwig, H. F.; "Mechanism of Flocculation in the Clarification of Turbid Waters"; *Journal AWWA*, February, 1949.
5. Pilipovich, Janet B.; Black, A. P.; Eidness, Fred A.; Stearns, T. W.; "Electrophoretic Studies of Water Coagulation"; *Journal AWWA*, November, 1958.
6. Black, A. P.; Buswell, Arthur M.; Eidness, Fred A.; Black, A. L.; "Review of the Jar Test"; *Journal AWWA*, November, 1957.
7. Cohen, J. M.; "An Improved Jar Test Procedure"; *Journal AWWA*, November, 1957.
8. Cosens, Kenneth W.; *Water & Sewage Chemistry & Chemicals*, PUBLIC WORKS, October, 1956.
9. *Standard Methods for the Examination of Water, Sewage and Industrial Wastes*, Tenth Edition, American Public Health Association, 1955.

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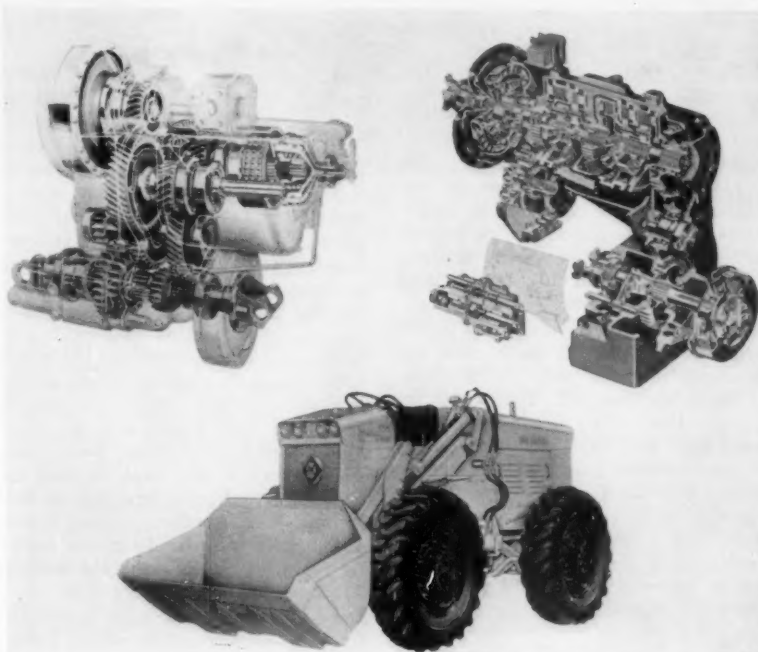
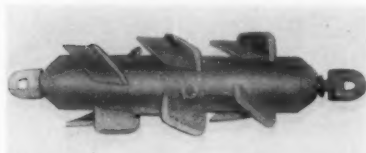
Two new fire hydrants for municipalities have been introduced by Kennedy. These new hydrants are the K series and consist of a standard model and a new Safetop safety breakable section style. Both conform to all specifications of the AWWA. In both hydrants, the K-10 and K-11, all working parts are easily removed for maintenance or repair without excavation. Another new feature is the Alemite fitting located in the operating nut for lubrication. The K-10 Standard model has a bolted standpipe section which make nozzle rotation possible and is made in 4, 4½ and 5-inch. The K-11 is the new Safetop model and includes all of the refinements incorporated in the K-10, but in addition has the safety breakable section. More from Kennedy Valve Mfg. Co., Elmira, N. Y.

Use card facing page 34 for more information. Circle No. 12-1.

Root Hog

A new self-rotating sewer cleaning tool, the Root Hog, has been developed. It is of heavy welded construction throughout and has specially designed cutters which will not injure the pipe wall. It removes roots by double action, forward for cutting and reverse for dragging out roots. Other features include a swiveled draw bar of tool steel for extra strength and threaded ballast plug for weight control. Hardened cutters are available as optional extras. The Root Hog comes in stock sizes from 8-in. through 18-in. round sewer pipe. For full data write the Juswel Company, 1266 Acton Road, Columbus, O.

Use card facing page 34 for more information. Circle No. 12-2.



Power-reversing transmission at upper left; Allison full power shift, upper right.

Loader Transmissions

Two types of transmission are available with the TL-14 Tractor-Loader front-end wheel loader—either the Allison transmission, or the new Tractomatic power reversing transmission. The four-speed Tractomatic transmission reduces initial capital outlay for a wheel loader without sacrificing essential advantages. On this transmission, a single hydraulically operated steering column lever controls both forward and reverse movement without clutching, shifting gears, or stopping the machine. First gear offers a forward speed of 3.2 mph

and reverse speed about 30 percent higher—4.2 mph. First gear is for heavy work. Second gear is utilized for general loading. Third gear is used when roading up inclines or traveling over uneven ground. Fourth speed permits rapid travel over level ground. Model TL-14 is available with either an 86-hp 6-cylinder gasoline engine or an 83-hp diesel. Write Allis-Chalmers Mfg. Co., Deerfield Works, Deerfield, Illinois.

Use card facing page 34 for more information. Circle No. 12-3.

New Automatic Parking Control

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Use card facing page 34 for more information. Circle No. 12-4.

Accessibility and Performance in new Jaeger 3-in. Pumps



New Jaeger intermediate and heavy 3-in. contractors pumps are designed to permit quick removal of the entire suction chamber and liner plate without removing the volute. Adjustment, rotation or replacement of the liner can be completed in a few minutes. The Model 3PN will pump all the water a 3-in. suction hose can handle at 5-ft. lift. With a 4-in. suction hose it delivers 28,000 gph at 10-ft. lift. Self-priming at 10-ft. lift takes only 15 seconds; requires only 50 seconds at 25-ft. suction lift. The pump is lighter than the previous model, weighing 395 lbs. complete with pneumatic tired truck. It is powered with a Wisconsin engine. The 3XPN has the same accessible volute design and comparably stepped-up performance in a smaller capacity pump. More from The Jaeger Machine Co., 550 West Spring St., Columbus 16, Ohio.

Use card facing page 34 for more information. Circle No. 12-5.

Loader Features Self-Loading Bucket

A new reverse mounted loader, the RL-400 Series by Henry is designed primarily for stock pile work. The one-yard self-loading bucket is loaded by hydraulic power and does not depend on the traction of the tractor. The bucket is designed to mount on utility tractors and has a lifting capacity to full height of 3,000 pounds. Breakaway capacity is 4,500 pounds. More data from Henry Manufacturing Co., Inc., Box 521, Topeka, Kans.

Use card facing page 34 for more information. Circle No. 12-6.



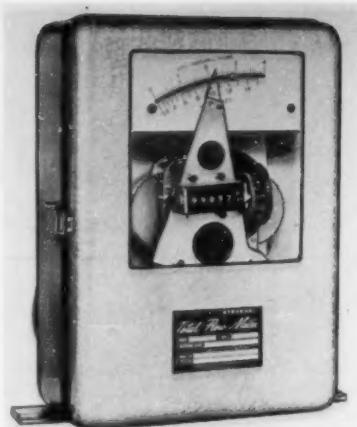
Crawler Tractor

The TD-25 diesel tractor, most powerful crawler produced by International Harvester Co., is available in either a torque converter or gear-drive version. Both models are powered by International's DT-817 turbo-charged six-cylinder, four-cycle, direct-starting engine developing 230 net horsepower at the flywheel at 1,500 rpm. Four speeds forward and reverse are offered by the torque converter TD-25, which has a drawbar pull up to 70,000 pounds at .75 mph, with adequate weight and traction. Operating weight is 46,000 pounds. The gear-drive TD-25, with an operating weight of 45,000 pounds, has a 46,700-pound drawbar pull in first gear at rated governed speed. It has eight speeds forward and reverse. A three-point track suspension materially lengthens the life of track rollers, track chains and pins and bushings. The tractor is equipped with "planet-power" system, which permits turning with controlled power on both tracks and provides instant power shifting from one speed range to the next, as well as one-hand hydraulic braking of the tractor. With standard 24-inch track shoes, the crawler is 104 inches wide. Its overall length is about 197 inches. Area of ground contact with 24-inch shoes is 5,652 square inches. For more information write Consumer Relations Dept., International Harvester Co., 180 North Michigan Ave., Chicago 1. Ill.

Use card facing page 34 for more information. Circle No. 12-7.

Flow Meter for Open Channels

A new Stevens total flow meter measures the flow of sewage, industrial wastes, irrigation water or other liquid flowing in open channels. Total volume of flow is read from a counter-totalizer while instantaneous rate of flow and head are indicated by a pointer and scale. A red index sliding on the indicator scale and driven by the pointer indicates peak flow. Simple formulas are provided for converting the totalizer and flow scale readings to other volume and flow units such as MGD, GPM and acre-feet. Cam and index pointer are activated by float action and the integrator disk is driven by an 8-day clock. The following measuring devices are standard: 6-inch Parshall flume, 90° V-Notch weir, 1-foot Cipolletti weir or 1-foot rectangular weir without end contractions. The same meter if equipped with proper scales can



Meter totals, records and indicates.

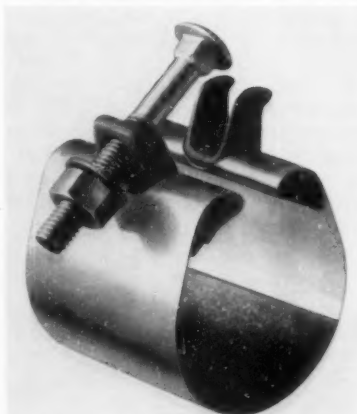
be used with other widths by proportional adjustment of the multiplier factor applied to the indicator and totalizer readings. More from Leupold & Stevens Instruments, Inc., 4445 NE Glisan, Portland 13, Oregon.

Use card facing page 34 for more information. Circle No. 12-8.

Pipe Repair Clamp

Mechanical features which provide even distribution of pressure during tightening and insure the smooth functioning of the clamp without danger of crushing weak pipe are features of the Adams No. 220 pipe repair clamps. These clamps are available out of stock for pipe diameters from 1/2" to 8" and in lengths from 3" to 12". They are also obtainable on special order for pipe diameters up to 24" and in lengths up to 21". Data and prices from Adams Pipe Repair Products, 2453 Merced Avenue, South El Monte, Calif.

Use card facing page 34 for more information. Circle No. 12-9.



Clamp distributes pressure equally.

Tractor Shovels



Functionally designed styling features new Trojan line.

Two new Trojan tractor shovel models have been announced, the models 134 and 164. The Model 134 has a lifting capacity of 8,000 pounds. Buckets of 1, 1 1/3, and 1 2/3-cubic yard capacities are available. This unit has a dumping clearance of 10'2" under the bucket hinge pin, and 8'8" under the bucket cutting edge. The Model 164 has a lifting capacity of 10,000 pounds. Buckets have 1 1/3, 1 2/3, and 2-cubic yard capacities. Dumping clearance is

10'3" under the bucket hinge pin, and 8'6" under the bucket cutting edge. Both are available with either gas or diesel power, and are equipped with power shift 3-speed transmission, and a 3.5 to 1 torque multiplying torque converter. More information from regional Trojan distributors or from The Yale & Towne Mfg. Co., Trojan Div., at Batavia, N. Y.

Use card facing page 34 for more information. Circle No. 12-10.

Mixing Plant



No guy wires are required for this "self-erecting" plant.

This stabilization mixing plant travels on its own trailer-chassis at normal truck speeds and at the job-site lifts itself hydraulically to operating position in 90 seconds. The new unit utilizes the B-G Model 828 mixing plant, with a capacity in excess of 400 tons per hour. It can handle a wide range of mineral materials, and an equally wide range of stabilizing agents; calcium chloride, cement, water, emulsified asphalts, etc. In traveling position, the 828 Plant is carried entirely within the standard 8-ft. highway limits and no special permits for its movement are required. Information on the various combinations of aggregates and on specifications from Barber-Greene, Aurora, Illinois or from any Barber-Greene distributor.

Use card facing page 34 for more information. Circle No. 12-12.

New Hydraulic Derrick Saves Labor

The addition of an all-new oscillating hydraulic derrick is announced by McCabe Powers. The new unit, the Series PM-30 "Pole-Master," has a vertical operating arc of more than 200 degrees. In addition to its vertical movement, the PM-30 adds a new time-saving dimension to derrick operation. It can be moved horizontally, at any angle of elevation, to any point in a 180-degree arc which reaches from one side of the body to the other. The wide range of horizontal and vertical movement permits working in places where space is limited as in alleys and narrow streets. The truck can be parked parallel to the curb, for handling the complete pole-setting job without blocking traffic. The derrick is also used with the "Earth-Master" hydraulic digger, which digs up to 20" in diameter and 10' in depth. When not in use, the digger swings out of the way or can be locked in the stowage bracket. Controls, including those for winch, body jack, pole jack and engine speed, can be installed where desired. All operation is powered by a hydraulic pump driven by a power



take-off installed on the truck transmission. PM-30 derricks are available in two sizes, each rated at 8,000 lbs. The PM-30-55, with a head sheave which can be hydraulically extended or retracted, has a maximum sheave height of 26 ft. and can handle 55-ft. poles. The PM-30-40, having a fixed head sheave, has a maximum height of 21'6". Data from McCabe-Powers Body Co., 5900 North Broadway, St. Louis, 15, Mo.

Use card facing page 34 for more information. Circle No. 12-11.

Motor Grader Snow Plow

A large Model BV14 Balderson Snow Plow is now available through Caterpillar Dealers for the Cat No. 14 Motor Grader. On this plow, the moldboards are curved to lift the snow and throw it to the side. Replaceable shoes, nosepiece and cutting edges make the Balderson V-type plow a snow removal tool that will outlast the motor grader. The plow attaches quickly to the king pin in front of the motor grader; it may be controlled either by Cat scarifier controls or by Cat hydraulic controls. Specifications include front height 4'3"; rear height 7'8"; cutting width 10'6"; extreme width 12'; weight 2730 lbs. with double acting scarifier control, 2880 lbs. with double acting hydraulic control. Contact the Caterpillar dealer or Balderson Inc., Wamego, Kans.

Use card facing page 34 for more information. Circle No. 12-13.

Packer Sani-Tainer



Interchangeable 3-yd. container in position for dumping into refuse packer body.

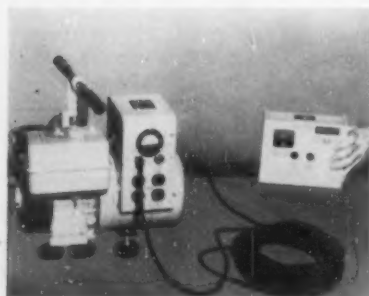
A 3-yd. Sani-Tainer for use with Power Packer refuse collection units is announced by Daybrook. The Sani-Tainer is loaded entirely by hydraulic lifting arms which, with a single control lever, raise the Sani-Tainer to a 70° dumping angle and return the container to the ground when it is empty. Completely interchangeable with all other

Daybrook Sani-Tainers, no special attachments or adjustments are necessary to change from one size to another. Write Daybrook Hydraulic Division, Young Spring & Wire Corporation, Bowling Green, Ohio.

Use card facing page 34 for more information. Circle No. 12-14.

Automatic Charger and Remote Start-Stop Control

A new auto-charge FAC-500 transistorized unit that automatically starts and stops generators as the starting battery condition demands has been announced by Pacific Mercury. The transistorized unit is enclosed in a 6" x 8" box that utilizes the existing remote control receptacle in the control panel of all PM model electric plants. To operate, the function switch of the electric plant is placed in auto-charge position. Relative conditions of the battery that cause



Control adjusts to battery condition.

the electric plant to start or stop are adjustable. The unit can also be used as a manual remote start-stop control. More from Pacific Mercury, 13232 Leadwell, North Hollywood, Calif.

Use card facing page 34 for more information. Circle No. 12-15.

Hydraulically Extensible Boom Works Under Full Load

The new 400-E fully-hydraulic Versa-Lift Crane provides versatility and greater load-handling ease. The hydraulically extensible and/or retractable boom incorporates two exclusive features: a cable take-up system keeps loads at the same height or distance as the boom is extended or retracted; and the extensible boom feature does not affect the load-capacity of the boom or crane. As a result, the boom extends or retracts under full load, regardless of the angle. The crane works in a full 360 degree circle and lifts from 7000 lbs. at 8 ft. to 3500 lbs. at 16 ft. More from Teale & Co., Box 308, Omaha, Nebr.

Use card facing page 34 for more information. Circle No. 12-16.

Outdoor Reading and Servicing for Water Meters

A new meter box that permits outdoor reading and servicing of water meters is called the "Meterminder". It is installed in an outside wall just above the house foundation. This reduces reading and servicing time and eliminates call backs by meter readers. It is designed principally for basementless homes. The exterior cover and the drip tray is fabricated of a rubber-resin compound so that it will never corrode. Remaining parts are of aluminum to simplify installation and to provide a corrosion resistant installation. It is available in two models for 5/8" water meters and for 3/4" and 5/8" x 3/4" meters. A companion "Meterminder" is also manufactured for use in homes with basements. More from Handley-Brown Co., 2101 Brooklyn Rd., Jackson, Mich.

Use card facing page 34 for more information. Circle No. 12-17.

Path Surveying Instruments Added to Bruning Line



Path surveying instruments include 4" and 6" transits, transit levels, dumpy levels, eye levels, tilting levels and pocket levels. Bruning has added these and will continue to distribute Brunson instruments. The Path instruments use Japanese lenses, providing excellent definition; distinct, powerful magnification of images; and accuracy on targets. Instrument adjustment tools, a plumb bob, magnifying glass and sunshade are standard equipment. More from Charles Bruning Co., Inc., 1800 West Central Rd., Mount Prospect, Ill.

Use card facing page 34 for more information. Circle No. 12-18.

Reworking Roads



Harrow used for renewing oil roads.

In many conditions, one or two passes through scarified oil road surfacing with a Rome Disk Plowing Harrow can reduce the material to aggregate size for easy blending. Here are the steps taken in Springfield, Ill., to reclaim chuck-holed oil roads: 1) The oil road was ripped with a motor grader scarifier; 2) Traxcavator with Rome Disk Plowing Harrow made one or two passes, as required, reducing scarified oil road to small, easily blended pieces; 3) material was bladed and leveled with the motor grader, then rolled to specified smoothness and density, and oiled where necessary. It was found that this method produced a fine, smooth road at minimum cost and low investment. More information on procedures and on the harrows from Rome Plow Company, Cedartown, Ga., or from the local Rome-Caterpillar Dealer.

Use card facing page 34 for more information. Circle No. 12-19.

Speedy Records Handling With Rotary Card File

A two-drum rotary card file is engineered to speed up the handling of active records. Using it, one person can manage efficiently all filing and posting of up to 15,000 active records. To find a card, the clerk touches the proper button. A selectomatic control system instantly revolves the proper drum and automatically stops it when the desired section reaches the position in front of the operator. The cards are in an easy-to-find position and automatically open into a visual "V". This assures quick, easy reference and also signals the refiling location if a card is removed for posting. More from Mosler Safe Co., 320 Fifth Ave., New York 1, N. Y.

Use card facing page 34 for more information. Circle No. 12-20.

Hydraulic Bullgrader for IHC T-340

A hydraulic bullgrader, 85¼-inches wide and heavily reinforced for high-capacity earthmoving, just announced by IHC, uses only two control levers to deliver a wide range of angle, tilt and height adjustments. The blade can be set to a depth of 11¼ ins. below grade and raised to a height of 35 ins. above grade. Angling positions vary from 25° right to 25° left. Either end of the blade can be raised or lowered as much as 15 ins. With its high lift capacity, the bullgrader makes an excellent tool for work on slopes, banks and shoulders and provides sufficient leverage for re-



Wide blade, with wide reach and angle.

moving trees and stumps. When in the tilt position, the blade can be used for ditching and cutting irrigation ditches. More from Consumer Relations Department, International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

Use card facing page 34 for more information. Circle No. 12-21.

Diesels for Trucks

Hercules Motors Corporation has introduced a completely new line of diesel engines ranging from 50 to 350 horsepower in three, four, six and eight cylinder models. These are designed specifically for light and medium trucks (up to 55,000 lbs. gross combination weight). Several of these new diesels utilize a combustion system that makes possible the use of a wide variety of fuels—including diesel oil, kerosene, jet fuel, gasoline. No adjustment is required when fuels are changed. These diesels require little or no change, other than replacement of the engine itself, in a conversion from gasoline to diesel power. These diesels also can be used to power materials handling equipment, construction machinery, boats and industrial equipment. More from Hercules Motors Corp., 101 Eleventh St., S.E., Canton 2, Ohio.

Use card facing page 34 for more information. Circle No. 12-22.

Portable Asphalt Plant

A new and completely portable 3,000-pound batch capacity asphalt plant, available from Standard Steel Corporation, can be transported to any job and be producing hot mix within eight hours. Production capacities are as high as 120 tons/hour. Outstanding features are:

super-lift dryer, high speed mixer; push button batching control; positive control of liquid asphalt; and a portable dust collecting unit. More from Standard Steel Corp., Box 58252, Los Angeles 58, Calif.

Use card facing page 34 for more information. Circle No. 12-23.



Asphalt plant can be transported to the job and produce hot mix within 8 hours.

King-Size Light



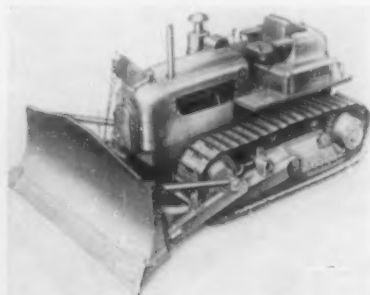
Long distance in barricade flashers.

Claimed to be the biggest, brightest barricade flasher on the market, the new Dietz warning light has a lens 8 ins. in diameter and delivers 60 candle power for 650 hours. As an abutment safety, light on toll roads and all limited access highways, the new No. 680 flasher is equipped with a single face parabolic reflector lens, two NEDA No. 6 dry cells, transistorized circuit, carrying handle and mounting bracket. Flash rate is 65 per minute. Tamper-proof mounting and on-off bolts require special Allen-type wrenches. Finished in beacon yellow, it is available with either amber or red lenses. Weight is 8 lbs. More from Department P, the R. E. Dietz Co., Syracuse, N. Y.

Use card facing page 34 for more information. Circle No 12-24.

Euclid C-6 Crawler Tractor Weighs 42,000 Pounds

The new Model C-6 tractor of Euclid Division of General Motors is now in production at Hudson, Ohio. The Model C-6 has 211 net hp and a Torqmatic Drive consisting of torque converter and semi-automatic transmission that eliminates the master clutch. Changes from one of the three forward speed ranges to an-



Master clutch eliminated in tractor.

other, and from forward to reverse and back again, are made under full engine power. Smooth and positive track control is provided. Operator visibility is exceptionally good. Easy accessibility for servicing is an important design feature. There are few lube points; major components are "out in the open." Total ground contact area is 5069 sq. in.; bare operating weight is 42,000 lbs.; top speed, forward and reverse, is 7.9 mph. More data from Euclid dealers or the Euclid Division, GMC, Cleveland 17, Ohio.

Use card facing page 34 for more information. Circle No. 12-25.

Improved Sewer Cleaning Bucket Machine and Truck Loader

The O'Brien Sewerking Bucket Machine is designed to take out large deposits of sand, silt, roots and other heavy obstructions from sewers. It operates completely by power at a great reduction in labor and job time. Built for heavy duty and safe-



ty in use, it has many automatic control features. It is offered in 9, 16 and 25 HP. and is also available in a model that incorporates a continuous dumper feature, which takes the bucket loads as they come from the sewer and conveys them directly into a truck. Data from O'Brien Manufacturing Corp., 5632 Northwest Highways, Chicago 46, Ill.

Use card facing page 34 for more information. Circle No. 12-26.

Plug Valve Operator and Automatic Lubricator

Roto Hammer is a self-contained mechanical operator designed not to over-lubricate valves but to allow additional lubrication if desired by the operator. It provides a ground level control for remote operation of



Self-contained plug valve operator.

overhead plug valves. It saves on initial installation costs by enabling valves in overhead lines to be installed in straight runs, eliminating the need for routing piping to ground level or providing a platform. It makes possible hand operation and easy lubrication of such overhead valves from ground level. The unit is also available as a hand operator for valves at ground level. More from Roto Hammer Co., 2804 West 40th St., Tulsa, Okla.

Use card facing page 34 for more information. Circle No. 12-27.

Insect Control by Spraying or Dusting

A new all-purpose insect control machine may be used for air-blast spraying, high volume spraying with a hose, dusting, or pellet broadcasting. The blower is 35-in. of axial-flow type; motor is 56 hp., Wisconsin air-cooled. This unit will be of value to cities for controlling shade tree infestations and mosquito and fly breeding. It can also be used as a pellet-broadcaster, spreading the granules evenly over a very large area for mosquito and fly control. Granules contain 5 percent Malathion in a filler of diatomaceous earth that will dissolve in moisture as rains fall or as water levels rise. Thus control action may be taken when convenient and still be effective when it is needed. Another unique advantage of these granules is that they penetrate thick growth, hitherto difficult or impossible to reach. More from Besler Corp., 4053 Harlan St., Emeryville, Oakland 8, Calif.

Use card facing page 34 for more information. Circle No. 12-28.

Electronic Communications For Two-Way Radio

A new electronic device when wired into a base station or remote control, allows the operator of the private two-way radio equipment to talk from a mobile unit into any public telephone, local or long distance. This is accomplished in the following manner: A telephone contact is established between the operator of a base station and any party with available public telephone service. The telephone handset at the base station is then placed in the specially designed Carterfone cradle. From then on the broadcasting and receiving operations are entirely automatic. The speaker's voice at the far end of the telephone connection automatically places the station on the air. When he ceases to speak, the base station control automatically returns to receiving position, and the mobile unit speaker's voice is carried through into the telephone handset. The Carterfone is completely transistorized to permit instantaneous switching from broadcasting to receiving without the use of on-and-off switches. It requires no additional installation in mobile units whatever. An auxiliary speak-

er is provided with the unit and base control operator can hear when conversation ends. Illustrated literature from Carter Electronics Corporation, 6762 Greenville Ave., Dallas 31, Texas.

Use card facing page 34 for more information. Circle No. 12-29.

Casting Concrete Pipe by Extrusion

Extruded concrete pipe lines, from 24 ins. to 120 ins. in diameter can be constructed in place by the Hanson Extruda-Cast method. Considerable savings in cost are claimed. The machine operates in a trench carefully excavated to the dimension of the outside diameter of the pipe to be laid. Control of grade can be held to very close tolerances. An engine in the forward part of the machine propels the machine in the trench at the desired speed. Light weight aluminum forms are used, supported on the inside by full circle struts. Approximately 500 feet of 36-inch pipe can be laid per day, with proportionate variations for larger or smaller pipe. Various shapes are also possible, inside and out. The pipe as laid is without joints. Prefabricated fittings

are used and manholes are easily installed. An interesting 4-page technical folder is available from R. A. Hanson Co., Inc., Moscow Road, Palouse, Wash.

Use card facing page 34 for more information. Circle No. 12-30.

"Speed-Thru" Pipe Pushers Now in Three Sizes

Mercury Hydraulics, 1632 - 46 Wazee Street, Denver, Colorado, has announced major design changes in their fully powered "Speed-Thru" pipe pushers. Major changes on all 1960 models incorporate a new higher speed, 12-inch stroke design, pushing one foot in 11 seconds. New Mercury pushers come in three sizes capable of gripping up to 4-in. ID pipe, and have thrusts up to 110,000 lbs. The shorter stroke serves to increase speed and provide easier handling due to the shorter length and lighter weight. Other features include a non-crushing, self-gripping and releasing pipe clevis, wider trackage and a 20 percent increase in operating pressures. Mercury Hydraulics, Inc., 1632 Wazee St., Denver 2, Colo.

Use card facing page 34 for more information. Circle No. 12-31.



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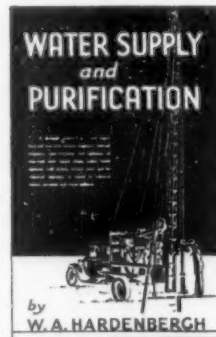
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Burton M. Yost, District Mgr.

Los Angeles 36, Calif.
5478 Wilshire Blvd.
Hugh Hollyday, % Smith & Hollyday
David W. Zander

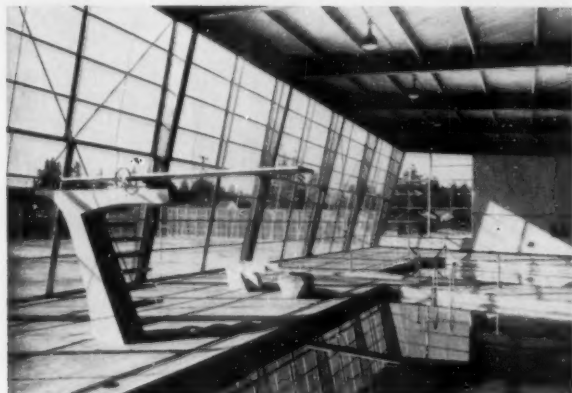
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Robert J. Shea, Mid-West Sales Mgr.

Philadelphia 10,
1434-36 Land Title Bldg.
Rod Ellis

San Francisco 4, Calif.
22 Battery St.
Bill Smith, % Smith & Hollyday

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4916 West 64th St., Mission, Kansas
C. H. Stockwell

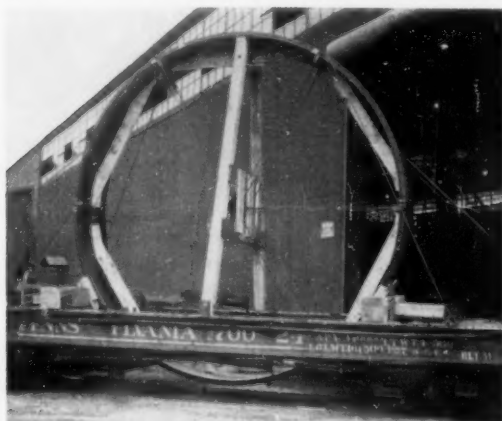
WORTH SEEING



Year-round swimming in municipal pools gets a new lift through this clever adaptation of the overhead garage door to enclose a North Bend, Oregon, pool in winter. Overhead Door Corporation, Hartford City, Ind., are the door makers.



This Athey Force-Feed loader working on snow loading in Rochester, Minn., in winter can switch to other materials handling jobs in summer. Right now it provides snow removal speeds to 20-25 cu. yds. a minute, loading directly into trucks.



16-ft. solid ring Dresser coupling ready to ride on special flat car, enroute to irrigation pipe line for California's Sacramento Valley. Couplings weigh 4,400 lbs. each, are designed to operate at pressures above 288 psi.



In experimental Allis-Chalmers tractor a mixture of fuel gases—largely propane—and oxygen reacting in an electrolyte within 1008 fuel cells powers it electrically to provide in excess of 3000 lb. drawbar pull.

Triumphal arrival in Winter Park, Fla., of 1000th Smith & Loveless factory-built sewage lift station. Winter Park officials and manufacturers celebrate jointly its arrival.



Dodson's Digest



Slip-up

I was buttering my toast one Tuesday morning, when, out of the blue, my wife said, "I wish I knew how to fix toast like they do at the Inn. It's delicious. Don't you think so?" It is, and I said so, and that was that.

On Wednesday morning, she mused, "There's something about the pickled beets they serve at the Inn that I just can't analyze. But I've never tasted any quite as good. You like them, too, don't you?" It's true. Any time after noon I can make a meal of those beets.

On Thursday morning, I spoke first: "How about dinner at the Inn tonight?" And she answered, "What a wonderful idea!" Now whose idea do you think it was?

But I made the plans—left the car with her, rode to the office with Charley Barnett, called the Inn for reservations, checked the shows in town . . .

My wife was scheduled to pick me up at six that evening, and I was sure she'd be on time. But she wasn't. By 6:15 I began to worry, because the roads had turned icy. I called home. No answer. By 6:30, I was frantic. I called the police. No accidents reported. At 6:45 I called home again . . . and my wife answered. What a relief!

"Where have you been?" I asked.

"Right outside," she replied, "trying to dig my way into the garage. The door is frozen fast."

"Honey," I said, "you of all people know better than that. Don't dig. Just sprinkle some Calcium Chloride in front of the door."

"Do you know where the Calcium Chloride is?" she asked. Then it dawned on me. The Calcium Chloride was in the garage. I took a cab home.

On Friday morning, I left the car with my wife, rode to the office with Charley Barnett, called the Inn for reservations, checked the shows in town . . .

—L. D. DODSON

P.S. For the facts on how to fight ice in winter, check our leaflet, "Melt or Skid-proof Icy Surfaces with Wyandotte Calcium Chloride." A copy is yours free for the writing. Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.

Wyandotte
CHEMICALS



MICHIGAN ALKALI DIVISION

HEADQUARTERS FOR CALCIUM CHLORIDE



by Arthur K. Akers

★ **Earl H. Bradley**, president B-I-F Industries, Inc., Providence, was recently honored by his alma mater, Brown University, at a 3-day convocation on "Man's Contracting World in an Expanding Universe."

★ **Enterprise Engine & Machinery Co.**, San Francisco, climaxed a general sales meeting with an award to **Austin Crouchley**, New York branch manager for achieving highest sales volume. Our fellow-Long Islander, **J. E. Barthmaier** becomes Northeast district manager for Enterprise, headquartering in New York City.

★ **Pfaff & Kendall** news from Newark includes: a new sales agency in Portland, Oregon, under **Verne Campbell**, sales manager of the Traffic Safety Supply Co. Also, **William B. Gile & Associates**, Charlotte, take over P&K lighting and traffic equipment sales in the Carolinas.

★ **Minnesota Mining & Mfg. Co.** promotes **John J. Verstraete, Jr.**, to the newly-created position of Director of Communications within the company.



Mr. Vilven

posts in the western states.

★ **Sika Chemical Corp.** of Passaic, N. J., opens a new district sales office in Kansas City, in charge of **John F. Esping**.

★ **Flex-O-Lite Mfg. Corp.**, St. Louis, announces imminent openings of two new manufacturing plants, in Paris, Texas, and St. Thomas, Ontario. Both will manufacture glass beads for use in reflectorized paint in the highway field.

★ **Wallace T. Miller** becomes assistant managing director, Cast Iron Pipe Research Association, Chicago. He has been especially active in supervising the Association's current nation-wide campaign to create public support for improved water facilities.



★ **Theodore Van Zelst** is elected a vice president of Cenco Instruments Corp., Chicago. He remains as president of Soiltest, Inc.

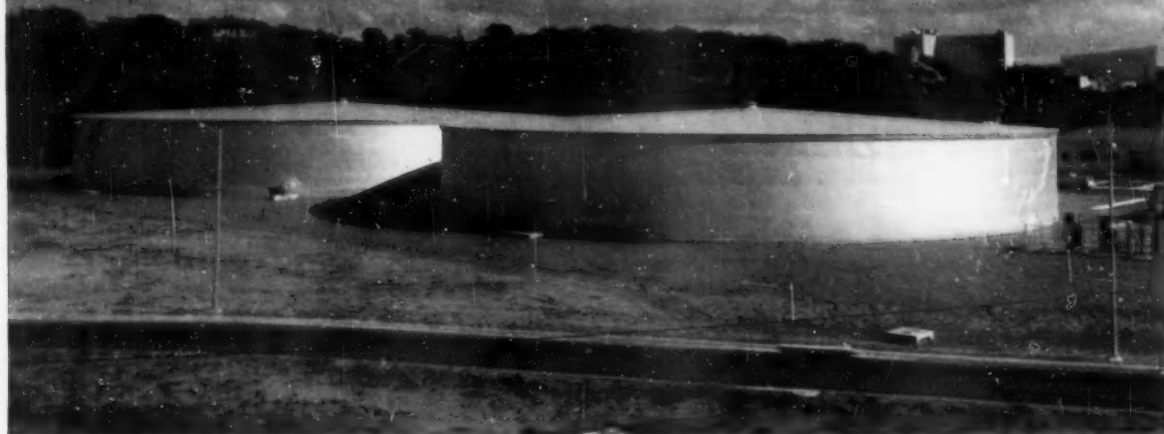
★ "Dod Says" will no longer be bylined by **L. D. Dodson**, manager of Calcium Chloride and Public Business Department for Wyandotte Chemical Corp. He retired, to Florida, on Nov. 1. **F. Robert Sproule** succeeds him.

★ **John W. Northcutt**, assistant vice president of the Rockwell Mfg. Co., Pittsburgh, has been named an Advisor to the Director of Water and Sewage Industry Utilities Division, U. S. Department of Commerce. Swearing-in ceremonies are pictured above.

★ Then there was the Texan who bought two Cadillacs and took his change in Volkswagens.

TANKS OF STEEL

...the most reliable for water storage



These 6,000,000 gallon CB&I-built steel reservoirs serve the City of Fort Worth, Texas

All CB&I-built reservoirs, standpipes and elevated tanks for municipal water storage conform to standards established by The American Water Works Association . . . the nation's foremost authority on water storage structures. Only steel tanks provide the protective assurances set forth in AWWA standards. A bottle-tight CB&I-built steel tank or reservoir will benefit your community because:

- *CB&I Tanks save you the cost of expensive special interior coatings or sealing compounds often needed to stop or prevent leaks in other-than-steel tanks.*
- *CB&I Tanks give you the peace of mind*

which comes with a performance guarantee. Few contractors will provide such a guarantee . . . unless steel is used.

- *CB&I Tanks give you the tangible economy of trouble-free service life . . . which steel tanks historically provide.*
- *CB&I Tanks give you the protection of AWWA standards for maximum safety . . . unobtainable with any material other than steel.*

These protective assurances are yours with the purchase of a durable, bottle-tight CB&I steel tank. Think it over and we believe you'll agree . . . *Your community is safer with steel.*

CHICAGO BRIDGE & IRON COMPANY



332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Write today for your copy of
the bulletin describing Steel
Reservoirs and Standpipes.

**There's
no
waste water
from
a V-notch**

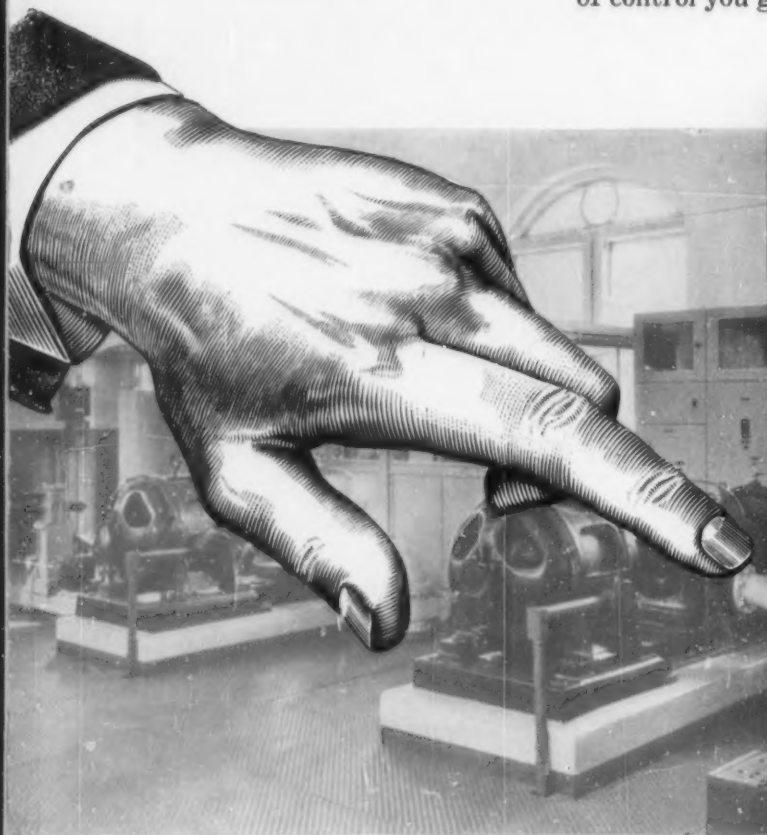
Why?

Because a V-notch Chlorinator needs no auxiliary water supply

You can plan on clean, dry chlorinator rooms with no messy drain—no chlorine gassing back. And best of all... gone forever is the high cost of wasted auxiliary water.

And, of course, the right plastics make the whole chlorinator chlorine-proof.

Yet these are just added benefits to the main job: Simple, dependable, wide range chlorine control. The kind of control you get only with a W&T V-notch Chlorinator.



A booklet, "The V-notch Story" will tell you about all the W&T V-notch Chlorinator features. For your copy write Dept. S-128.78



WALLACE & TIERNAN INCORPORATED

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